

**PM_{2.5} NATIONAL AMBIENT AIR QUALITY STANDARDS (NAAQS)
IMPLEMENTATION RECOMMENDATIONS FROM THE ADVISORY
BOARD TO THE VIRGINIA AIR POLLUTION CONTROL BOARD**

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THE PM_{2.5} WORKGROUP OF THE STATE ADVISORY BOARD

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PM_{2.5} National Ambient Air Quality Standards Implementation Recommendations From the Advisory Board to the Virginia Air Pollution Control Board

SECTION 1

INTRODUCTION

Monitoring data from 2000-2002 indicated that two areas in Virginia may now exceed the annual National Ambient Air Quality Standard (NAAQS) for fine particulate (PM_{2.5}), Bristol and Roanoke. On April 5, 2003 EPA released guidance on delineating nonattainment area boundaries. The presumptive nonattainment areas for Bristol and Roanoke, as defined by the EPA guidance, would be the Office of Management and Budget (OMB)-designated "metropolitan statistical areas" (MSA) in which the monitors for Bristol and Roanoke-Salem are situated. However, the effective size for a nonattainment area - in order to protect human health, reduce emissions and meet the standard - may be larger or smaller than this. EPA has provided a list of nine criteria that may be used either to exclude parts of the MSA, or to include additional nearby areas in the nonattainment area.

The issue of delineating PM_{2.5} nonattainment areas is of imminent practical importance, because Virginia will have to designate two nonattainment areas for PM_{2.5} by early next year. States and tribes have until February 15, 2004, to recommend to EPA what areas should be designated as attainment and nonattainment. EPA will review those recommendations and respond to the states and tribes by late summer 2004, notifying them of any modifications EPA wants to make. States can then comment on EPA's modifications. New air quality data for the year 2003 will become available in mid-2004. EPA expects to consider the 2001-03 data when making the final designations by December 15, 2004.

The PM_{2.5} NAAQS Implementation Team has collected site-specific information for the Bristol and Roanoke areas that is pertinent to the nine EPA criteria used to develop alternate boundaries. This includes: air quality data that shows the contribution of various PM_{2.5} species to the overall PM_{2.5} mix, air quality in potentially included vs. excluded areas, emissions data portrayed spatially for the region, level of control of emission sources, traffic and commuting patterns, expected growth, population density in included vs. excluded areas, meteorology, topography, and jurisdictional boundaries. It is possible that excluding certain areas, or including others, might facilitate attainment of the standard. The site-specific information presented in this report can be used by DEQ to assist in expanding or limiting the nonattainment boundaries.

1.1 Designating Nonattainment Areas

In setting each nonattainment boundary for $PM_{2.5}$, DEQ's task should be to define a geographic area in which (1) air quality does not meet the ambient air quality standard for $PM_{2.5}$ because a monitor showing nonattainment is representative of air quality in that area and (2) there are a sufficient number of sources of $PM_{2.5}$ that, if subjected to reasonable controls, will bring air quality in the area into compliance with the $PM_{2.5}$ ambient standard. This can be a challenging task because making an area nonattainment imposes economic burdens and is politically unpopular. Local government officials provide input to the designation process, and they are reluctant to include areas where monitoring data are inconclusive because nonattainment areas must meet more stringent regulatory requirements.

Delineating a nonattainment area depends on two altogether different concepts. The first is the concentration of $PM_{2.5}$ particles in the air of the region, as represented by a monitor in one location. The principal technical issue is over what area (taking into account topography) is the monitor "representative" of air quality.

The second concept is the location of sources the control of which would solve the problem. In cases where $PM_{2.5}$ particles are transported into the nonattainment area from far away, there might in theory be a nonattainment area of enormous size (though if the source of the $PM_{2.5}$ were in a different state, Virginia would lack legal authority to do anything about it). Accordingly, to define a nonattainment area DEQ may need to take into account the long-distance transport of $PM_{2.5}$ particles and EPA's upcoming "transport" rulemaking.

Even if the sources of the pollution are in Virginia's jurisdiction, there may be an issue of distributive justice. Suppose the sources of the $PM_{2.5}$ at the monitor are a large number of small sources distributed throughout the territory to the west. The Commonwealth might choose either (1) to impose very harsh limits on a small number of responsible sources, which would allow a smaller nonattainment area, or (2) to impose less costly control requirements on a larger number of sources, calling for a larger nonattainment area. The question of what area to designate nonattainment is (of course) intertwined with the question how to bring it into attainment.

These "source" considerations assume that the Commonwealth has no authority to control $PM_{2.5}$ sources that are outside the nonattainment area, or at least that the options for controlling sources outside the nonattainment area are more limited than for sources inside.

Three additional considerations might go into the definition of the nonattainment area. First, elected leaders in areas about to be designated nonattainment need to be consulted; and they may oppose the designation because of the burdens it will place on businesses and people in the area.

Second, delineation of the nonattainment area depends on where people live and breathe. That is one advantage of using consolidated metropolitan statistical areas (CMSAs) to delineate nonattainment areas. However, some observers have argued that CMSAs are *not* a good starting point for determining nonattainment area boundaries, giving at least three reasons. First, the sizes of MSAs vary from region to region of the country; the MSA may be too large to be appropriate in some cases and too small in others. Second, some expected PM_{2.5} nonattainment areas may not be in MSAs. Third, although EPA apparently expects PM_{2.5} to be a regional pollutant like ozone in the East, some observers anticipate a mix in the West with some highly localized PM_{2.5} nonattainment areas, such as a mountain community with wintertime wood smoke pollution. It has also been suggested that data on respiratory illness (such as hospital admittances) might be used, in addition to air quality monitoring data, to designate nonattainment areas.

The third consideration in delineating a nonattainment area is to use, if possible, easily recognizable boundaries such as streets and highways, so that it is easy to see what is in and what is out of the designated area.

Finally, boundaries could be adjusted (outward) to account for uncertainty, a larger area being designated where there are inadequate data or data of doubtful quality or other uncertainties.

1.2 EPA Guidance

EPA has issued proposed implementation guidance on ozone and particulate matter standards, dated November 17, 1998.¹ This draft guidance says that EPA anticipated that PM_{2.5} will behave like ozone. In 2000 EPA issued the memorandum *Boundary Guidance on Air Quality Designations for the 8-Hour Ozone National Ambient Air Quality Standards (NAAQS)*, which outlines 11 factors to use for making a designation recommendation for ozone.

On April 1, 2003, EPA addressed PM_{2.5} nonattainment areas directly in a guidance memorandum by J. Holmstead, Assistant Administrator, EPA, to Regional Administrators, entitled "Designations for the Fine Particle National Ambient Air Quality Standards" (April 1, 2003). This memorandum is not law but mere nonbinding "guidance." But EPA guidance carries much weight, and following it makes getting EPA's approval of nonattainment areas much easier.

¹ J. Seitz, *Proposed Implementation Guidance for the Revised Ozone and Particulate Matter (PM) National Ambient Air Quality Standards (NAAQS) and the Regional Haze Program* (Draft of November 17, 1998).

EPA asserts that the approach for PM_{2.5} is similar to the approach for the eight-hour ozone standard. EPA urges the states to harmonize their ozone and PM_{2.5} designation recommendations where appropriate.

EPA intends to apply a presumption that the boundaries for urban nonattainment areas should be based on “Metropolitan Area boundaries.” A Metropolitan Area, as defined by the Office of Management and Budget, may consist of a single Metropolitan Statistical Area in some cases, and a Consolidated Metropolitan Statistical Area in other cases. The presumptive use of Metropolitan Area boundaries, EPA says, is based on recent evidence that violations of the PM_{2.5} air quality standards generally include a significant urban-scale contribution as well as a significant larger-scale regional contribution.

For rural areas that violate the PM_{2.5} standards, EPA presumes that a full county should be designated nonattainment.

Despite these presumptions, EPA says that it will consider requests for urban nonattainment area definitions that deviate from OMB’s Metropolitan Area definitions on a case-by-case basis, considering the following factors:

1. Air quality in potentially included versus excluded areas
2. Emissions in areas potentially included versus excluded from the nonattainment area
3. Jurisdictional boundaries (e.g., counties, air districts, Reservations, etc.)
4. Population density and degree of urbanization including commercial development in included versus excluded areas
5. Traffic and commuting patterns
6. Expected growth (including extent, pattern and rate of growth)
7. Meteorology (weather/transport patterns)
8. Geography/topography (mountain ranges or other air basin boundaries)
9. Level of control of emission sources (SAB did not attempt to ascertain the level of control at existing emission sources.)

organic carbon account for up to 80 percent of the fine particulate matter collected in Roanoke and Bristol. The samples representing high $PM_{2.5}$ concentrations are relatively richer in sulfates than organic carbon. Metals, nitrogen oxides and elemental carbon are also relatively low. Analysis of air quality data for these areas also shows that in general, high $PM_{2.5}$ concentrations are associated with high ozone concentrations, and the particulate is rich in sulfate. (Figures 2–4, Virginia $PM_{2.5}$ Data Analysis Presentation by Kotur S. Narasimhan, VDEQ-Office of Air Quality Analysis).

Figure 2. $PM_{2.5}$ Speciation Data

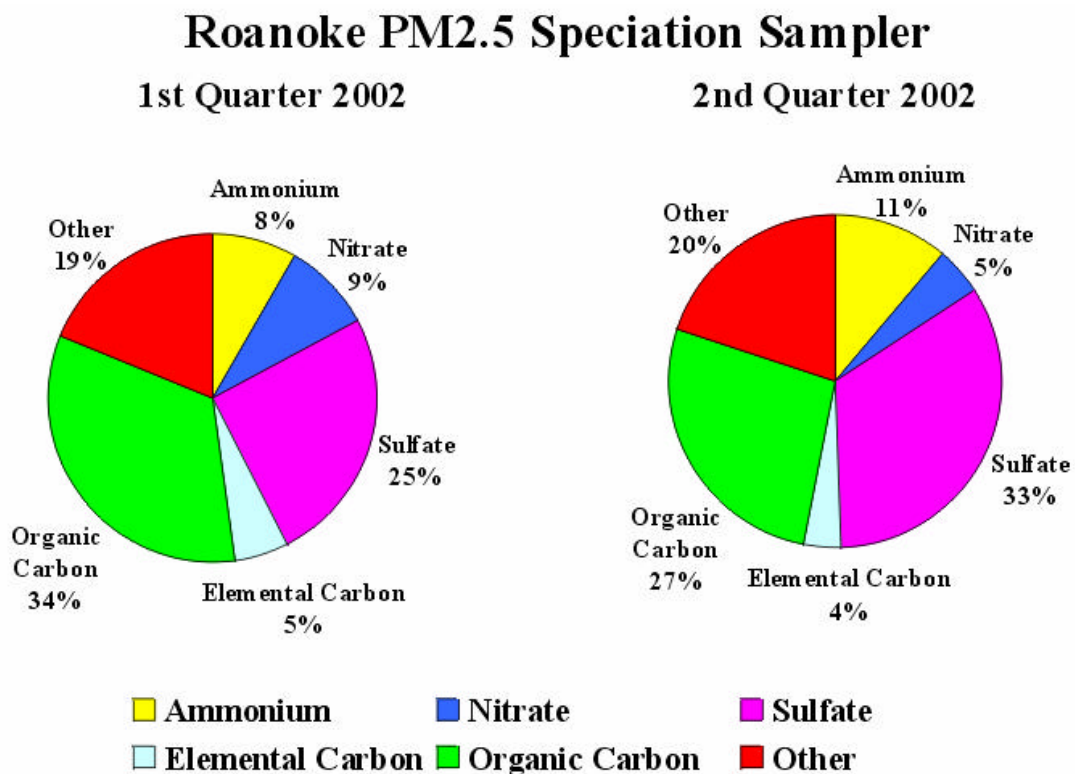


Figure 2 continued. PM_{2.5} Speciation Data

Roanoke PM_{2.5} Speciation Sampler

3rd Quarter 2002

4th Quarter 2002

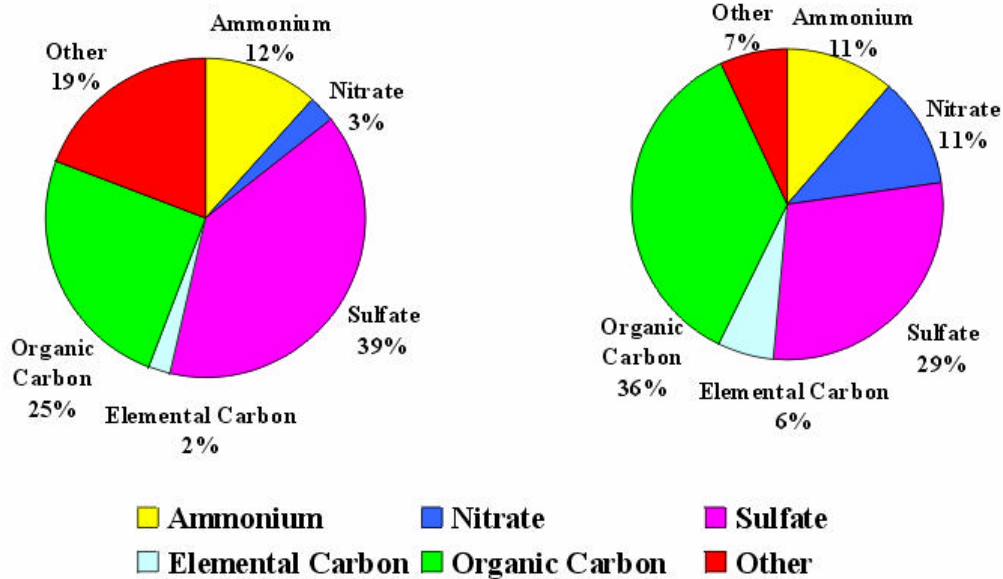
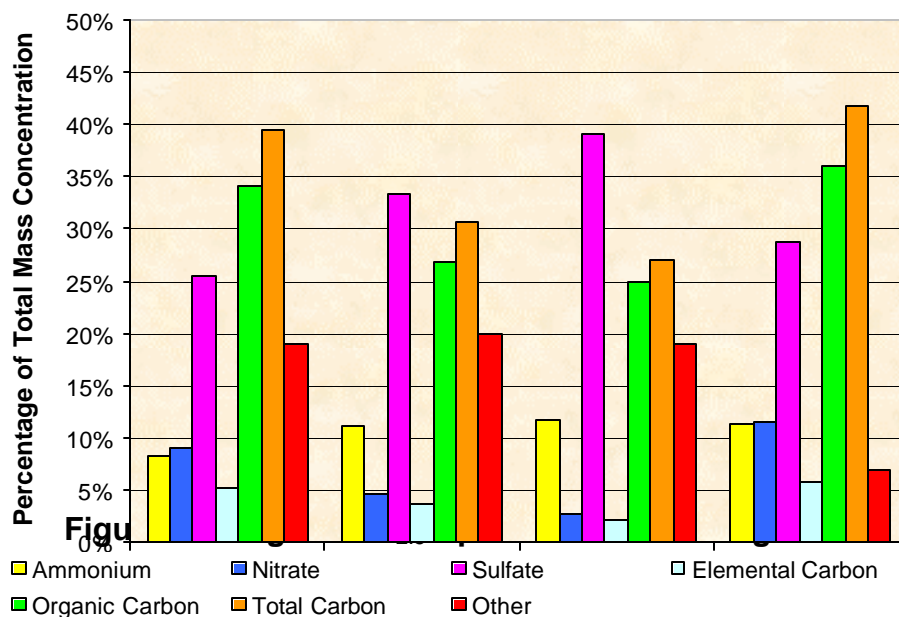
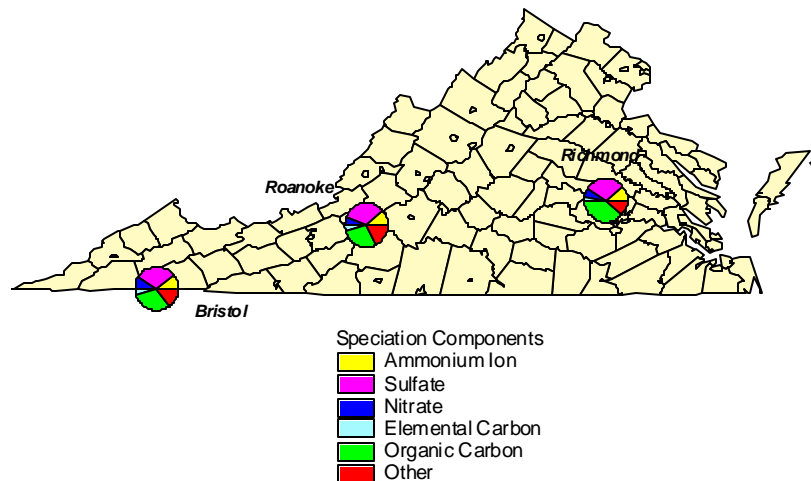


Figure 3. PM_{2.5} Speciation by Quarter

Roanoke PM_{2.5} Speciation Sampler 2002 by Quarter



Virginia PM_{2.5} Speciation Sites 2002 Annual Averages



Ambient air quality monitoring does not exist for all counties in Virginia, and it is difficult to find information that describes air quality in such potentially excluded areas. EPA is working on a method to extrapolate ozone concentrations beyond monitored areas, but the SAB is not aware of any similar efforts for PM_{2.5}. Therefore, changes from the presumptive boundaries would have to be made based on other criteria.

SECTION 3

EMISSIONS IN AREAS POTENTIALLY INCLUDED VERSUS EXCLUDED FROM THE NONATTAINMENT AREA

The speciated monitoring data indicate that the primary components of PM_{2.5} are sulfates and organic carbons. To view the spatial distribution of emissions in the vicinity of Roanoke and Bristol, the ArcView Geographic Information System was used to generate maps showing county emission totals for fine particulates, sulfur dioxides, and nitrogen oxides. Emissions data were obtained from the most recent (1999) EPA National Emission Inventory, available on EPA's AirData website. Maps displaying the emissions inventory data were broken down into two categories: point source emissions and total emissions. Point source emissions for each of the three pollutants are shown for the Bristol and Roanoke areas. Total county emissions, which include all point and area

sources, are shown for the entire state of Virginia. (EPA's AirData combines all area and mobile sources into one emissions category "areas sources").

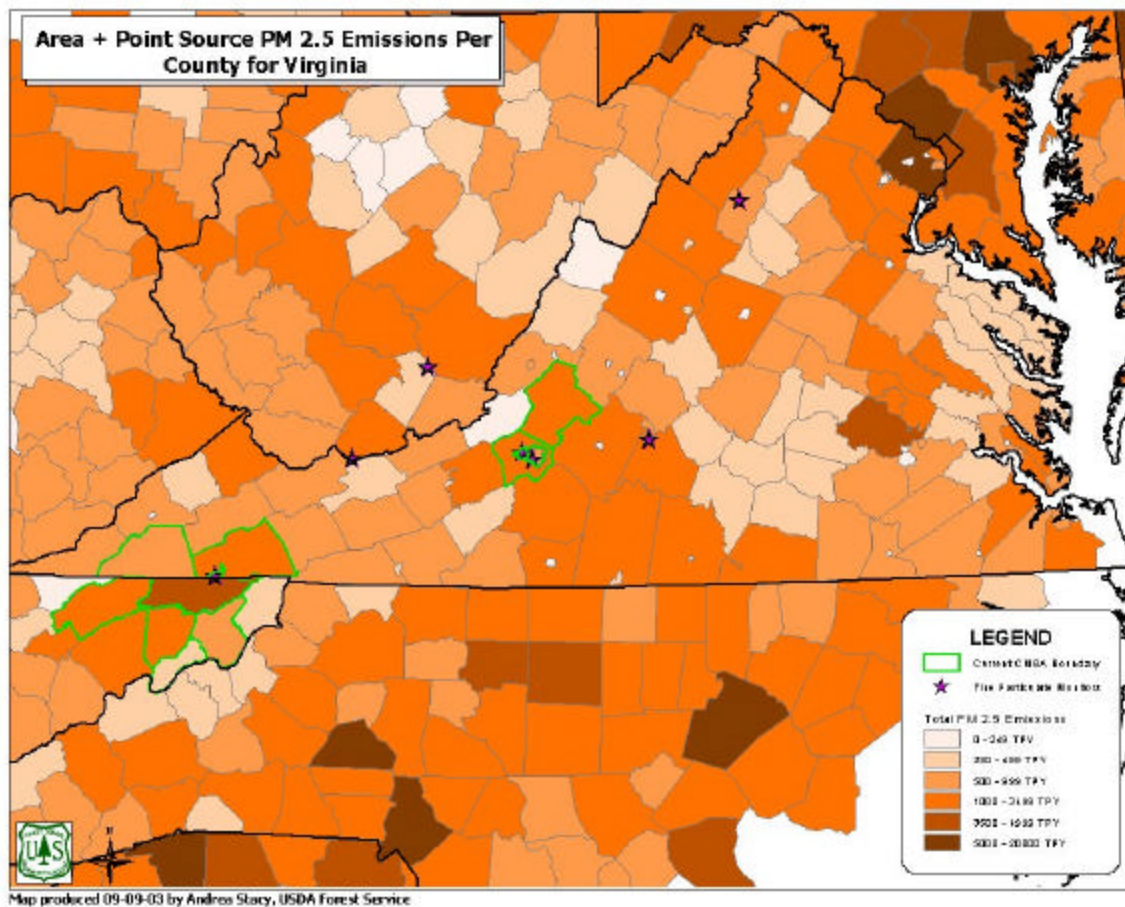
EPA has not yet received 1999 PM_{2.5} emission inventory data from the VADEQ. Hence, EPA estimated those emissions for Virginia using several different methods to prepare the NEI (National Emissions Inventory). Refer to EPA's "Current Methods Used to Estimate Emissions, 1985-1999 Procedures Document for National Emission Inventory, Criteria Air Pollutants 1985-1999", March 2001, EPA-454/R-01-006. The document is also available from the EPA web site: <http://www.epa.gov/ttn/chief/trends/index.html>

It is important to note that the emissions inventories include only "primary" pollutants. Monitored PM_{2.5}, as discussed in the previous section, reflects a combination of "primary" and "secondary" pollutants. The monitored PM_{2.5} data shows that on high extinction days, sulfates comprise a large percentage of the PM_{2.5} total load. Sulfate is a "secondary" pollutant, meaning that it is not emitted directly into the atmosphere (as primary pollutants are), but is formed through atmospheric chemical reactions in which sulfur dioxide (SO₂) undergoes a gas to particle transformation. Since the emissions inventory for PM_{2.5} includes only the primary emissions, we felt it was necessary to include the emissions of the chemical precursors to secondary PM_{2.5}, and hence sulfur dioxide and nitrogen oxides were added to the inventoried data. As shown in the monitoring data, organic carbon is the second largest component of the PM_{2.5} load. The emissions for organic carbon would be included under the "area source" category for the primary PM_{2.5} emissions.

It is well recognized that the PM_{2.5} emissions inventory is not as accurate as inventories for other pollutants. EPA developed the 1999 Virginia PM_{2.5} emissions inventories by using several different methodologies. EPA is in the process of improving the inventory. For this project it is important to realize that current figures may be either over- or underestimates of emissions for many sources. It is also important to note that the geographical representations of the emissions data are only meant to assist in determining where the highest emission sources are within the vicinity of the potential nonattainment areas. More extensive regional modeling that takes into account seasonal and weather contributions to secondary pollutant formation and transport would have to be done in order to determine source specific nonattainment contributions.

Total county-wide PM_{2.5}, SO₂, and NO_x emissions are shown in Figures 5, 6 and 7. Point sources of these pollutants in the vicinity of Roanoke and Bristol are shown in Figures 8-13. Tables containing specific point source emission information associated with Figures 8-13 are included in the Appendix. *The emission inventories associated with Figures 5-13 are included on the CD provided with the report.*

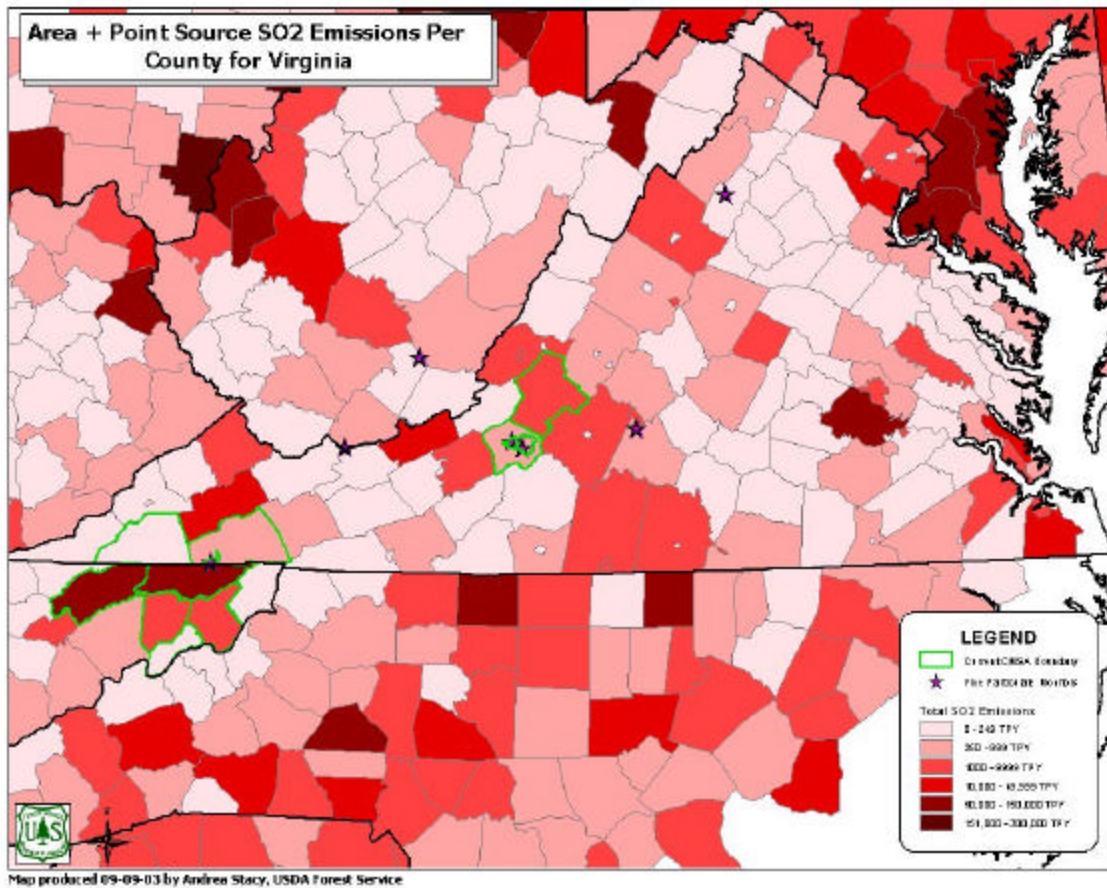
Figure 5. Total Fine Particulate Emissions



PM_{2.5} emissions in Figure 5 represent combined point and area sources. In the Roanoke area, emissions for Botetourt, Montgomery, Bedford, Franklin, Henry, Campbell and Pittsylvania Counties all fall into the same category (1,000 to 4,000 tons/year). Craig County has noticeably fewer PM_{2.5} emissions (0-250 tons/year).

PM_{2.5} emissions in the Bristol area were more variable between counties. Scott and Washington Counties (VA) show less than 1,000 tons/year, while Sullivan County (TN) has between 3,500 and 5,000 tons/year. Sullivan County likely influences air quality in the Bristol area.

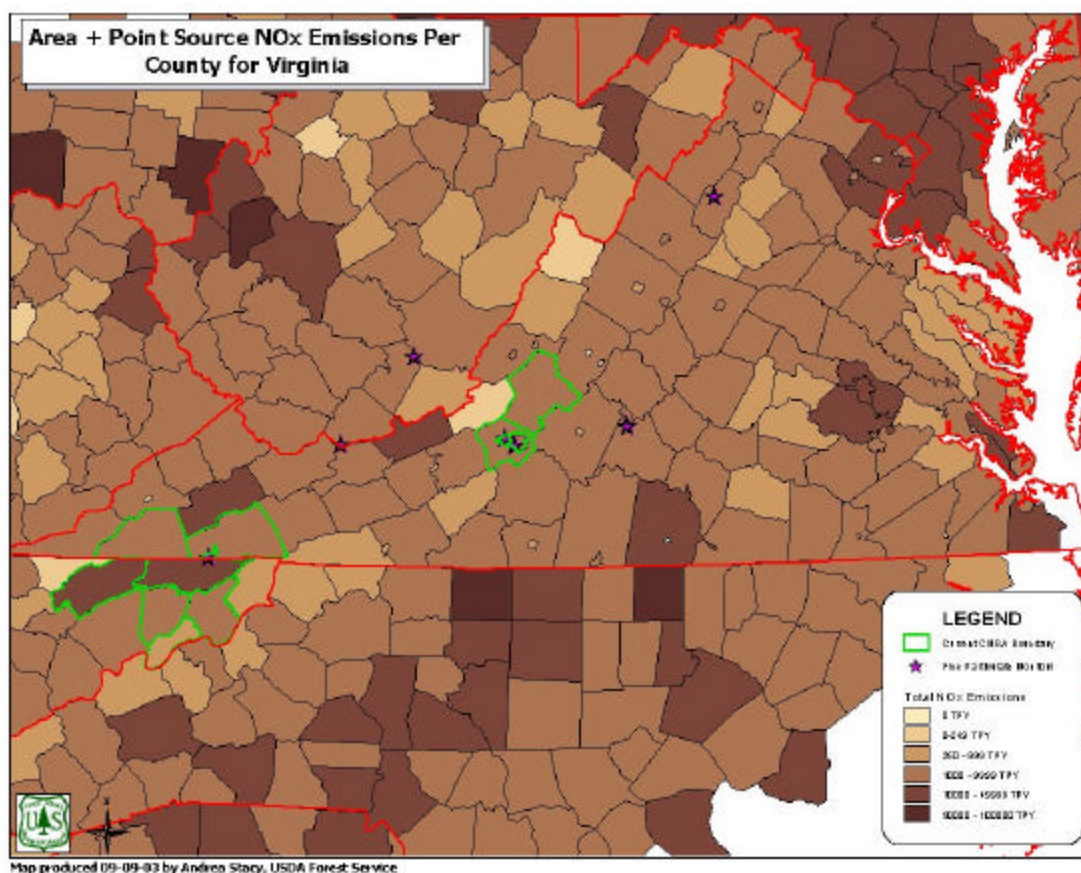
Figure 6. Total Sulfur Dioxide Emissions



Point plus area emissions of SO₂ vary in the counties surrounding Roanoke. Giles County shows the highest emissions (10,000 – 50,000 tons/year). Montgomery, Botetourt and Bedford Counties follow with 1,000 to 10,000 tons/year. Franklin, Floyd and Craig Counties show less than 250 tons/year of SO₂ emissions.

SO₂ point and area source emissions in the Bristol area show a similar pattern to the PM_{2.5} emissions. Sullivan County (TN) has the highest emissions at 50,000 to 150,000 tons/year. Adjacent Hawkins County falls in the same category. To the north, Washington and Scott Counties (VA) show less than 1,000 tons of SO₂ emissions per year. Again, Sullivan County appears to be influencing air quality in Bristol, VA.

Figure 7. Total Nitrogen Oxide Emissions



The map for area plus point source emissions of NO_x shows that all counties in the Roanoke area, except Floyd and Craig Counties, have emissions between 1,000 and 10,000 tons/year. Floyd County has less than 250 tons/year of NO_x emissions, and Craig County shows zero.

Area and point source NO_x emissions in the Bristol area again vary widely between the Virginia and Tennessee counties closest to Bristol, VA. The emissions inventory shows that Scott and Washington Counties (VA) have less than 1000 tons/year NO_x emissions. But, in Russell County (VA) and Sullivan and Hawkins Counties (TN) NO_x emissions are between 10,000 and 50,000 tons/year.

Figure 8. Fine Particulate Point Source Emissions in the Vicinity of Roanoke

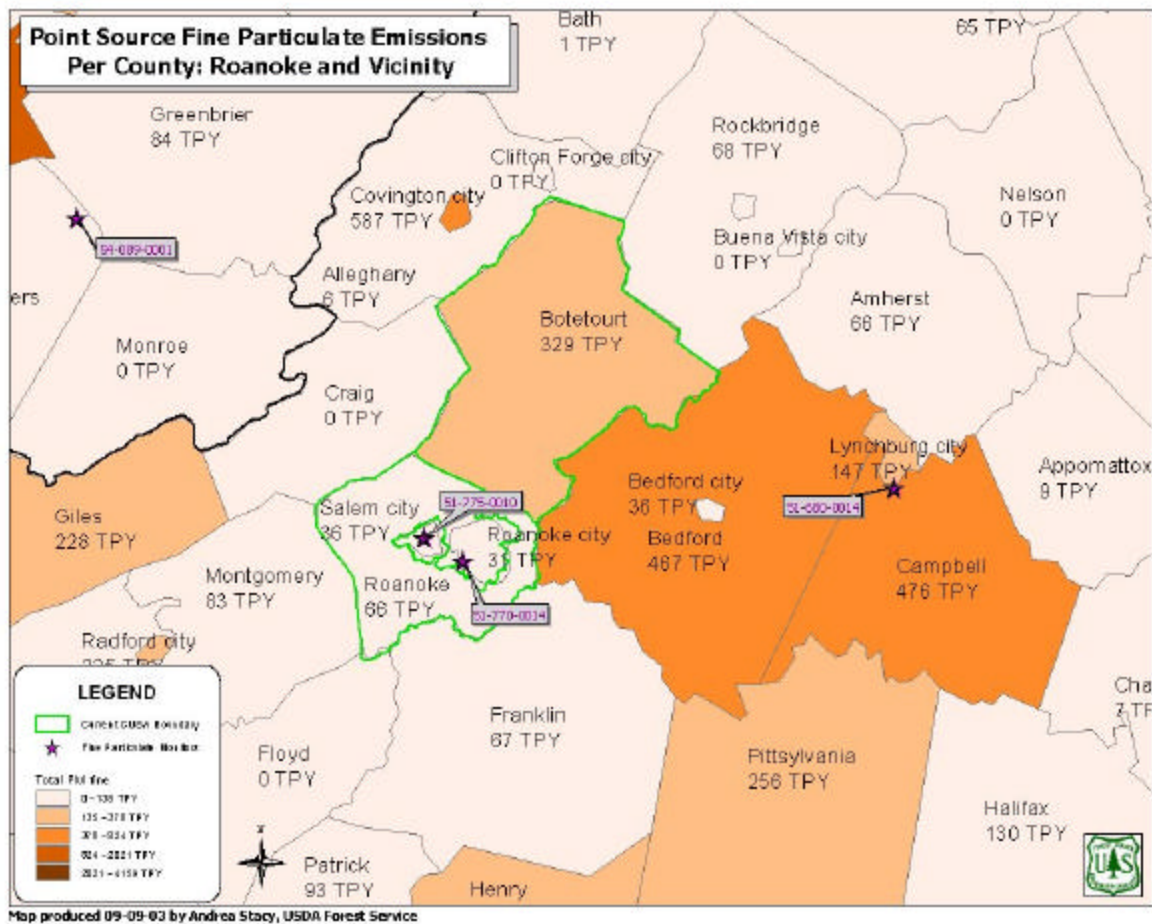
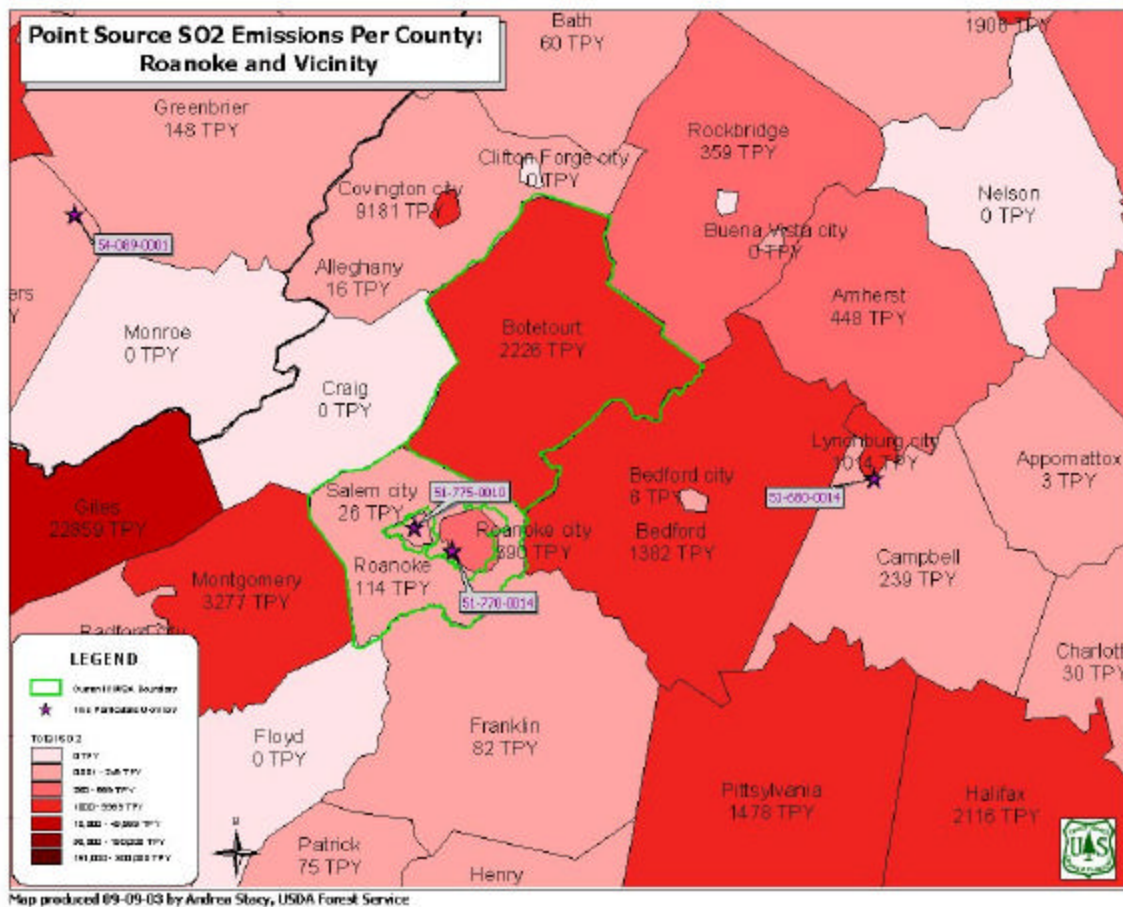


Figure 8 shows PM_{2.5} emissions from point sources only. Bedford County (407 tons/year) and Botetourt County (329 tons/year) show the highest emissions of all counties immediately adjacent to Roanoke County. All others show less than 100 tons/year, except Giles County that has 228 tons/year. City of Salem (36 tons/year) and the City of Roanoke (31 tons/year) contribute the smallest amounts of PM_{2.5} emissions to the Roanoke area.

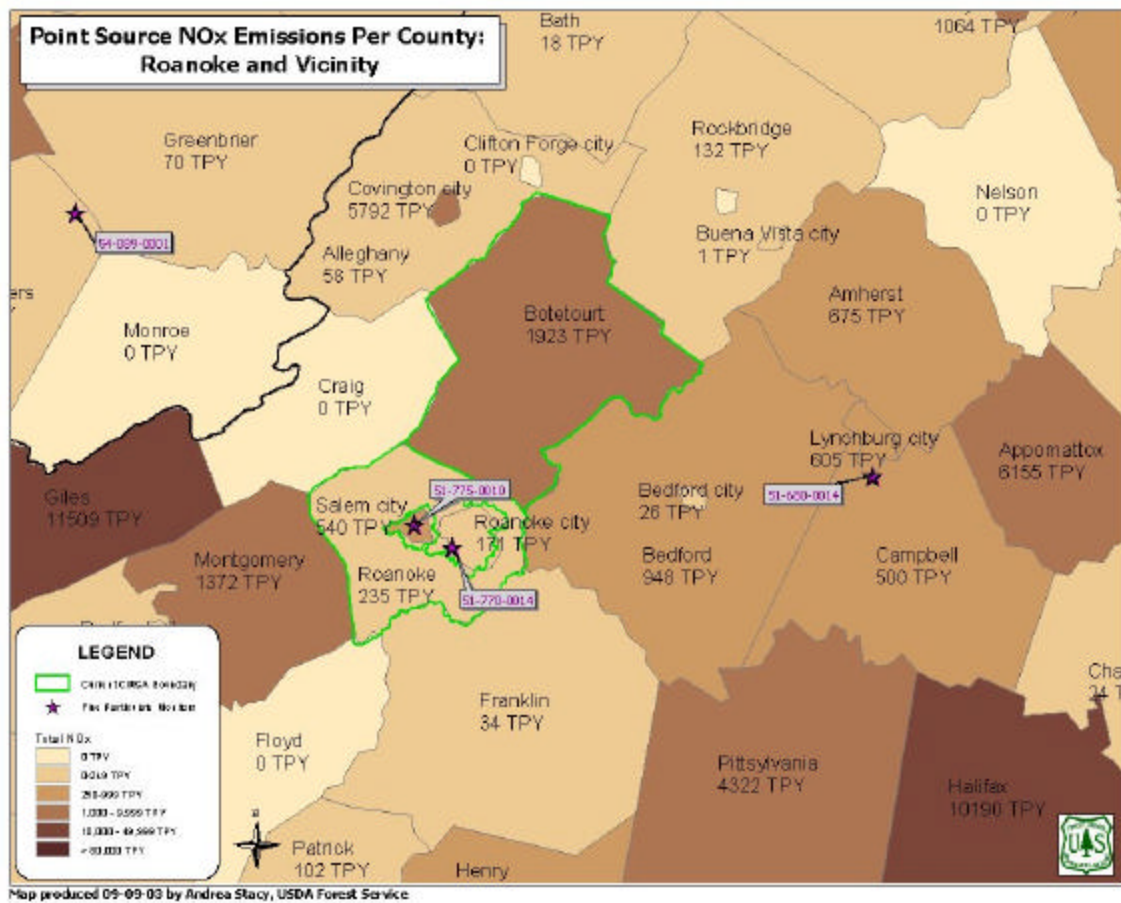
It seems that the Interstate 81 corridor and other transportation emission sources must constitute the majority of PM_{2.5} emissions in the Roanoke area, because the point source emissions comprise 20% or less of total emissions in these counties.

Figure 9. Sulfur Dioxide Point Source Emissions in the Vicinity of Roanoke



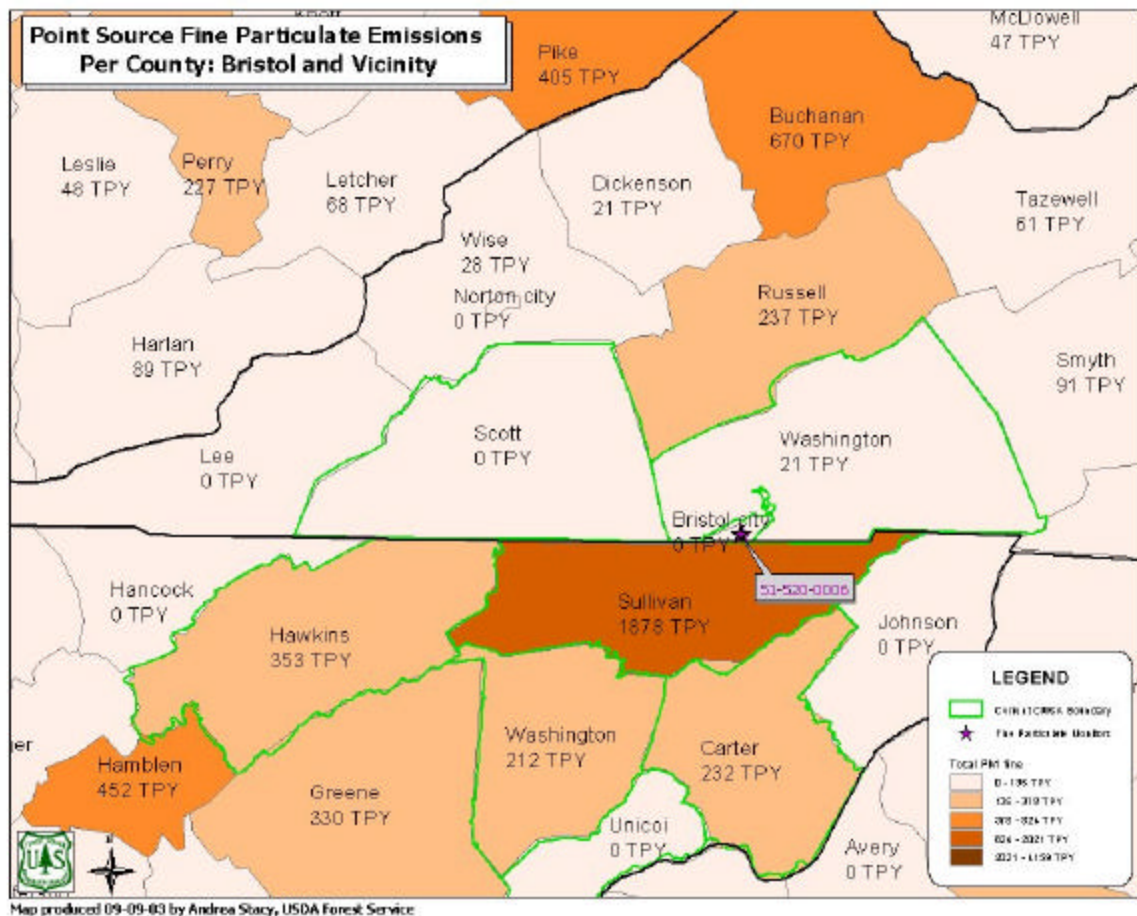
Point source emissions of SO₂ are by far the greatest in Giles County (about 23,000 tons/year), mainly due to the presence of an electrical generating unit and industrial source. Botetourt, Montgomery and Bedford Counties show about 1,000 to 3,000 tons per year. Roanoke County, Franklin County, and the Cities of Roanoke and Salem all show relatively low SO₂ emissions. Craig and Floyd Counties show zero SO₂ emissions.

Figure 10. Nitrogen Oxide Point Source Emissions in the Vicinity of Roanoke



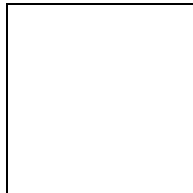
Considering only point sources of NO_x emissions, Giles County has the highest emissions (11,509 tons/year), followed by Montgomery County with 1,372 tons/year. Roanoke County and the Cities of Salem and Roanoke show less than 600 tons/year. Franklin, Craig and Floyd Counties have very few or zero NO_x emissions.

Figure 11. Fine Particulate Point Source Emissions in the Vicinity of Bristol



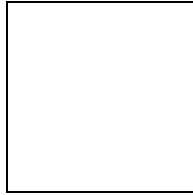
Point source emissions of PM_{2.5} are greatest in counties to the south of Bristol, VA. Sullivan County, TN has 1,876 tons/year and Hawkins County, TN has 353 tons/year PM_{2.5} emissions. The City of Bristol, and Scott and Washington Counties, VA show no point source emissions. This may indicate that area sources play a much bigger role for PM_{2.5} emissions along the Interstate 81 corridor.

Figure 12. Sulfur Dioxide Point Source Emissions in the Vicinity of Bristol



Point source SO₂ emissions to the south and north of Bristol City are very large. Russell County (VA) shows 24,493 tons/year, while Sullivan and Hawkins Counties (TN) have between 54,000 and 64,000 tons/year of SO₂ emissions. Bristol City itself and Scott County to the west each show zero SO₂ emissions.

Figure 13. Nitrogen Oxide Point Source Emissions in the Vicinity of Bristol



Point source NO_x emissions follow a pattern similar to SO₂ emissions. Russell County (VA), and Sullivan and Hawkins Counties (TN) show much higher NO_x emissions than Bristol City, Scott or Washington Counties (VA).

SECTION 4

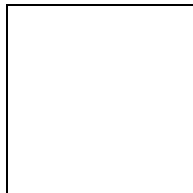
BOUNDRIES, POPULATION, AND TRAFFIC

4.1 Changes to the Roanoke Metropolitan Statistical Area (MSA)

On June 6, 2003, the federal Office of Management and Budget (OMB) announced changes to MSAs across the country. OMB used 2000 census data to formulate the new list of MSAs.

Among the changes made were that Craig County and Franklin County were added to the Roanoke MSA, expanding the population of the Roanoke MSA to 289,498 (2002 estimated) and its land area to 1,875 square miles (Figure 14). Previously the Roanoke MSA included only Roanoke and Botetourt Counties and the cities therein.

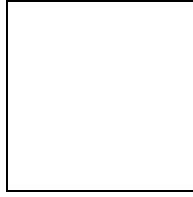
Figure 14. Roanoke MSA as of June 6, 2003



4.2 Roanoke Area Population

According to the U.S. Bureau of the Census, Virginia had a population of 6.6 million people in 1995. By 2025 that is expected to increase to 8.5 million people. In May 2003 the Virginia Employment Commission projected Virginia's population through 2030, including the eight counties in and adjacent to the Roanoke MSA, as shown in Figure 15.

Figure 15. Predicted Population Change for Roanoke Area



Population estimates in 2002 from the U.S. Bureau of the Census predicted the population change in Virginia from April 1, 2000, to July 1, 2002. The data include the eight counties in or adjacent to the Roanoke MSA. The estimates are shown in Figures 16 and 17:

Figure 16. U.S. Bureau of the Census 2002 Population Estimates

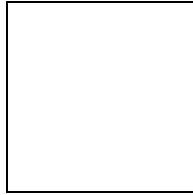
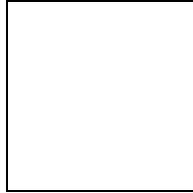


Figure 17. Roanoke MSA Compared to 2002 Population Change



4.3 Roanoke Area Traffic

Emissions from mobile sources are major contributors to fine particulate emissions; therefore it can be useful to examine traffic patterns when considering the optimum size for a nonattainment area. The Roanoke MSA is intersected by Interstate Highway 81, as shown in Figure 18. Other highways; 460, 220 and 221; carry local and long distance traffic into and across the Roanoke MSA. Figure 19 shows that traffic density is greatest in Roanoke, Montgomery and Botetourt Counties.

Figure 18. Major highways in the Roanoke area

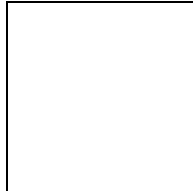
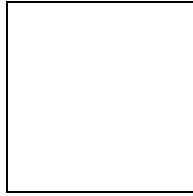


Figure 19. Traffic Density Rankings in the Vicinity of Roanoke



4.4 Roanoke Area County Ranking Based on Population and Traffic

Based on the above information, the population and traffic density rankings for the counties are as follows in Table 1.

Table 1. Ranking by County Based on Population and Traffic Density

- | | |
|------------------------|------------------------|
| • Population 1990-2030 | • Traffic Density 2002 |
| – Montgomery County | – Roanoke County |
| – Roanoke County | – Montgomery County |
| – Bedford County | – Botetourt County |
| – Franklin County | – Franklin County |
| – Botetourt County | – Bedford County |
| – Giles County | – Giles County |
| – Floyd County | – Floyd County |
| – Craig County | – Craig County |

4.5 Changes to the Bristol Metropolitan Statistical Area (MSA)

As part of the OMB's announced changes to MSAs, the Johnson City/Kingsport/Bristol MSA that formerly included Bristol City, the Counties of Scott and Washington in Virginia and the Counties of Carter, Hawkins, Sullivan, Unicoi and Washington in Tennessee (Figure 20) with a total population of 484,900 and land area of 2,865 square miles has been divided into three MSAs as listed below:

Bristol, VA Metropolitan Statistical Area (69,600 population, 575 square miles)

- Bristol City, VA
- Washington County, VA

Johnson City Metropolitan Statistical Area (183,900 population, 853 square miles)

- Carter County, TN
- Unicoi County, TN

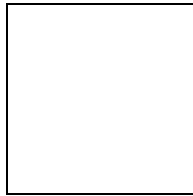
- Washington County, TN

Kingsport-Bristol, TN Metropolitan Statistical Area (231,400 population, 1,437square miles)

- Hawkins County, TN
- Scott County, VA
- Sullivan County, TN

These changes, made by OMB, are being challenged by local government leaders in the Tri-Cities area. A package detailing their objections has been provided to the SAB by the Bristol Chamber of Commerce.

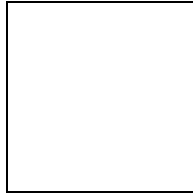
Figure 20. Johnson City/Kingsport/Bristol Metropolitan Statistical Area



4.6 Bristol Area Population

In May 2003 the Virginia Employment Commission projected Virginia's population through 2030, including the six counties in and adjacent to the Bristol MSA, as shown in Figure 21.

Figure 21. Predicted Population Change for Bristol Area



Population estimates in 2002 from the U.S. Bureau of the Census predicted the population change in Virginia from April 1, 2000, to July 1, 2002. The data include the counties in or adjacent to the Johnson City/Kingsport/Bristol MSA. The estimates are shown in Figures 22 and 23:

Figure 22. U.S. Bureau of the Census 2002 Population Estimates

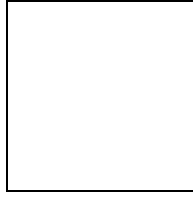
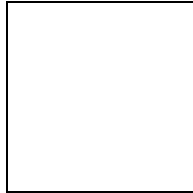


Figure 23. Bristol MSA Compared to Estimated 2002 Population Change



4.7 Bristol Area Traffic

The Johnson City/Kingsport/Bristol MSA is intersected by Interstate Highway 81 as shown in Figure 24.

Figure 24. Major highways affecting traffic in the Bristol area

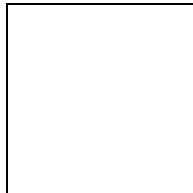
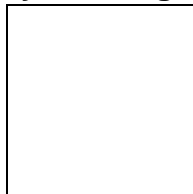


Figure 25. Traffic Density Rankings in the Vicinity of Bristol



4.8 Bristol Area County Ranking Based on Population and Traffic

Based on the above information, the population and traffic density rankings for the counties are as follows in Table 2.

Table 2. Ranking by County Based on Population and Traffic Density

- | | |
|------------------------|------------------------|
| • Population 1990-2030 | • Traffic Density 2002 |
| – Washington County | – Washington County |
| – Smyth County | – Smyth County |
| – Russell County | – Russell County |
| – Scott County | – Scott County |
| – Lee County | – Lee County |

SECTION 5

METEOROLOGY (WEATHER AND TRANSPORT PATTERNS) AND GEOGRAPHY

Figures 26 and 27 show that Roanoke and Bristol are both influenced by mountainous terrain. The wind rose plot indicates prevailing surface wind patterns.

Figure 26. Topography and Prevailing Wind Patters Affecting Roanoke

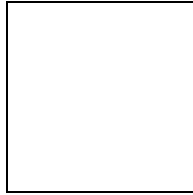
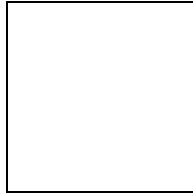


Figure 27. Topography and Prevailing Wind Patterns Affecting Bristol



It is well known that some amount of sampled fine particulate is transported from other areas. Back trajectory modeling allows you to follow the wind's path back in time. Figures 28, 29 and 30 show the path of winds that brought various particulate loads to the IMPROVE monitoring site located near the James River Face Wilderness and Natural Bridge Station, VA. (The IMPROVE network, Interagency Monitoring of Protected Environments, monitors visibility conditions at Class I areas throughout the nation.) The four daily trajectories shown on each map correspond to different arrival times in which an air parcel following the displayed trajectory arrives at the monitoring site. Red trajectories arrive at 0500 hrs. in the selected day, white at 1100 hrs., blue at 1700 hrs., and black at 2300 hrs. Arrival times are standardized to standard Mountain Time. Each plot symbol on a trajectory indicates an air parcel position three hours older than the next parcel along the trajectory line to the site. The length of the line represents the distance traveled over the past 5 days. More back trajectories are available at the Visibility Information Exchange Web System (VIEWS) and may be of use to VDEQ Staff when assessing the long-range transport of pollution into Virginia.

<http://vista.cira.colostate.edu/views/Web/AnnualSummary/BackTrajectories.aspx>

Figure 28. 8/8/2001 – Highest fine mass day for 2001 (IMPROVE) 29 ug/m³

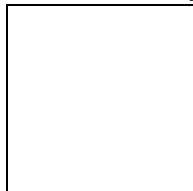


Figure 29. 11/15/2001 – High mass day with a different backtrajectory (approximately 27 ug/m³)

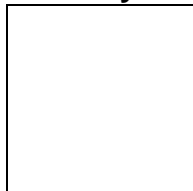
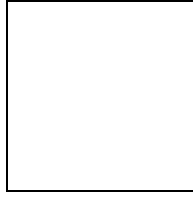


Figure 30. 12/18/2001 – Very low fine particulate concentrations (IMPROVE) 5ug/m³



SECTION 6

OBSERVATIONS

The observations reported here are based on the best information available to the work group. We caution readers, however, that we have not exhaustively reviewed all available information that may be relevant to the task of defining nonattainment boundaries. DEQ Staff will likely have access to additional information that will improve the analysis. Accordingly, this report represents a preliminary analysis rather than a complete one.

There are several factors at work in the Roanoke and Bristol areas that indicate deviation from presumptive nonattainment boundaries may be warranted. The available speciated PM_{2.5} data shows that sulfates and organic carbon account for the majority of the PM_{2.5}. It is generally recognized that monitored PM_{2.5} is a combination of pollution produced locally and transported in from some distance. Pending Transport Rules, when promulgated and implemented, should help reduce the transported pollution, however local emission reduction strategies within the nonattainment area will still be needed to bring the area into attainment.

6.1 Roanoke

- If control of mobile source emissions is integral to attaining the PM_{2.5} standard, then the population growth and traffic information suggest inclusion of Montgomery County in the nonattainment area.
- Assuming the presumptive boundary would coincide with the June 2003 MSA, then Montgomery County, and perhaps Bedford County, should be considered for inclusion in the nonattainment area.
- It may not be as important to include Craig County in the nonattainment area, because emissions, population and traffic pattern information indicate this area would provide limited opportunities for emission reductions.

6.2 Bristol

- If control of mobile source emissions is integral to attaining the PM_{2.5} standard, then the population growth and traffic information suggest that Smyth County, and perhaps Russell County, should be considered for inclusion in the nonattainment area.
- It may not be as important to include Scott County in the nonattainment area, because emissions, population and traffic pattern information indicate this area would provide limited opportunities for emission reductions.
- Based on the emission inventory data and wind patterns, we suspect that the most important steps to reaching attainment in Bristol will be actions taken by Tennessee in counties to the south of Bristol, VA.

Appendix A

Point Source Emission Tables Corresponding to Figures 8 through 13:

Table 1: SO₂ emissions (TPY) from point sources in the vicinity of Roanoke

COUNTY	ST	FACILITY NAME	EMISSIONS
Person	NC	Cp&L - Mayo Facility	25163.00
Rockingham	NC	Trigen Biopower Inc - Eden	9.00
Person	NC	Louisiana-Pacific Corp - Roxboro	1.00
Giles	VA	American Electric Power Glen Lyn	15987.00
Covington city	VA	Westvaco Pulp Mill	9181.00
Giles	VA	Celanese Acetate Llc	6458.00
Montgomery	VA	Alliant Ammunition & Powder Company Llc	2899.00
Botetourt	VA	Roanoke Cement Company	2217.00
Halifax	VA	Virginia Power Clover Power Station	1969.00
Bedford	VA	Georgia Pacific Corp Big Island Plt	1353.00
Lynchburg city	VA	Rock Tenn Co Mill	932.00
Danville city	VA	Dan River Incorporated Schoolfield	885.00
Pittsylvania	VA	Burlington Industries Incorporated Hurt Fin. Plant	601.00
Pittsylvania	VA	Solite Corp, Virginia Solite Division	468.00
Giles	VA	Chemical Lime Company - Kimballton Plant	413.00
Roanoke city	VA	Norfolk Southern Railway Company East End Shops	378.00
Montgomery	VA	Vpi & State University	378.00
Amherst	VA	Greif Brothers Corporation Of Virginia Riverville	330.00
Rockbridge	VA	Burlington Industries Inc	280.00
Pittsylvania	VA	Owens-Brockway Glass Co	268.00
Campbell	VA	Dan River Inc Brookneal Plant	170.00
Pittsylvania	VA	Goodyear Tire And Rubber Company Danville	111.00
Lynchburg city	VA	Griffin Pipe Products Company	80.00
Amherst	VA	Central Va Training Center	79.00
Rockbridge	VA	Stillwater Incorporated Goshen Plant	78.00
Roanoke	VA	Roanoke Electric Steel Corporation Roanoke Plant	62.00
Halifax	VA	Jps Converter And Industrial Corporation	49.00
Radford city	VA	Intermet Corporation Radford	45.00
Franklin	VA	Ronile Inc	38.00
Roanoke	VA	Halmode Apparel	35.00
Halifax	VA	Burlington Industries Inc Halifax	32.00
Franklin	VA	Lane Co Inc Rocky Mount Plt	32.00
Bedford	VA	Rubatex Corp Plants 1 & 2	28.00
Campbell	VA	Marvin V Templeton & Sons	28.00
Pittsylvania	VA	Southern Processors	25.00
Halifax	VA	Plantation Pipeline Company	25.00
Salem city	VA	Old Virginia Brick Co	24.00
Amherst	VA	Old Virginia Brick Co	24.00
Danville city	VA	Hickson Danchem Corporation	18.00
Roanoke	VA	Catawba Hospital	16.00
Alleghany	VA	Virginia Power Low Moor	16.00
Halifax	VA	J M Huber Corp	16.00

Campbell	VA	Georgia Pacific Corp Brookneal Plt	15.00
Halifax	VA	Apac-Virginia (South Boston)	15.00
Campbell	VA	Intermet Foundry Archer Creek	14.00
Amherst	VA	Old Dominion Job Corps Center	11.00
Halifax	VA	Felton Brothers Transit Mix Incorporated	11.00
Pulaski	VA	Magnox Pulaski Inc	8.00
Danville city	VA	Corning Inc	8.00
Campbell	VA	Altavista Power Station	11.00
Roanoke city	VA	Associated Asphalt Inc	10.00
Franklin	VA	Mw Manufacturers Inc	10.00
Botetourt	VA	Groendyk Mfg Co Inc	9.00
Pulaski	VA	Adams Construction Co Dublin	7.00
Pittsylvania	VA	Multitrade Of Pittsylvania Co Lp	4.00
Amherst	VA	M V Templeton & Sons Inc	4.00
Bedford city	VA	Golden West Foods Inc	3.00
Salem city	VA	John W Hancock Jr Incorporated	2.00
Roanoke city	VA	Hooker Furniture Corp	2.00
Appomattox	VA	Transco Station 170	2.00
Bedford city	VA	Sam Moore Furniture Inds Inc	2.00
Bedford city	VA	Waltex Corporation	2.00
Danville city	VA	Masonite Corp	1.00
Appomattox	VA	Thomasville Furniture Ind Inc-Va Operations	1.00
Franklin	VA	Technifoam Div Of P I Inc	1.00
Lynchburg city	VA	The Burruss Company Lynchburg	1.00
Campbell	VA	Burruss Company	1.00
Roanoke	VA	Koppers Incorporated Salem Plant	1.00
Pulaski	VA	Pulaski Furniture Corp Pulaski	1.00
Rockbridge	VA	Taylor-Ramsey Natural Bridge Station	1.00
Franklin	VA	Erath Veneer Corporation Of Virginia	1.00
Franklin	VA	Ferguson Land And Lumber Company	0.45
Bedford	VA	Taylor-Ramsey Corporation	0.44
Pittsylvania	VA	Columbia Forest Products	0.44
Roanoke	VA	Salem Frame Co	0.41
Pittsylvania	VA	Transco Gas Pipe Line Corp Station 165	0.37
Danville city	VA	Dimon International Inc	0.35
Campbell	VA	Charter Of Lynchburg Inc	0.31
Roanoke	VA	Carillion Roanoke Community Hospital	0.27
Pulaski	VA	Ethan Allen	0.19
Rockbridge	VA	Burke-Parsons-Bowlby	0.19
Franklin	VA	Cooper Wood Products Incorporated	0.19
Campbell	VA	Abbott Laboratories Ross Prdts Div	0.18
Lynchburg city	VA	R R Donnelley Printing Co	0.17
Roanoke city	VA	Fred Whitaker Co	0.12
Montgomery	VA	Corning Inc Blacksburg Plt	0.11
Pulaski	VA	Volvo Trucks/North America Inc	0.10
Roanoke	VA	Ingersoll Rand Co	0.09
Salem city	VA	Yokohama Tire Corp	0.09
Franklin	VA	Scott Manufacturing Inc	0.09
Campbell	VA	Bgf Industries Inc	0.07
Covington city	VA	Aet Packaging Films	0.07

Halifax	VA	D-Scan Furniture	0.07
Covington city	VA	Westvaco Virginia Inc Chemical Division	0.06
Campbell	VA	Bwx Technologies Inc	0.05
Pulaski	VA	Pulaski Community Hospital	0.05
Danville city	VA	Intertape Polymer Corp	0.03
Halifax	VA	Abb Power Generation Inc	0.03
Pittsylvania	VA	Southside Manufacturing Inc	0.02
Botetourt	VA	Columbia Gas Transmission Corporation Gala Compres	0.02
Alleghany	VA	Acadia Polymers	0.01
Lynchburg city	VA	Delta Star Incorporated	0.01
Halifax	VA	Tomkins Industries Lasco Bathware	0.01
Pulaski	VA	Jefferson Mills Incorporated	0.01
Pittsylvania	VA	Register Publishing Co	0.00
Campbell	VA	A.O. Smith Electrical Products Company	0.00
Montgomery	VA	Wolverine Gasket Div Eagle-Picher	0.00
Buena Vista city	VA	Mundet-Hermetite Inc	0.00
Roanoke city	VA	Akzo Nobel Coatings Inc	0.00
Roanoke	VA	Rowe Furniture Corporation	0.00
Pittsylvania	VA	Columbia Flooring	0.00
Montgomery	VA	Wolverine Gasket Division - Eagle-Picher Ind.	0.00

Table 2: PM_{2.5} emissions (TPY) from point sources in the vicinity of Roanoke

COUNTY	ST	FACILITY NAME	EMISSIONS
Caswell	NC	Vulcan Construction Materials Lp - Shelt	26.00
Caswell	NC	Apac-Virginia-Pelham Plant	13.00
Person	NC	Cp&L - Mayo Facility	372.00
Person	NC	Louisiana-Pacific Corp - Roxboro	81.00
Alleghany	VA	Virginia Power Low Moor	5.00
Alleghany	VA	Acadia Polymers	1.00
Amherst	VA	Greif Brothers Corporation Of Virginia Riverville	50.00
Amherst	VA	Old Virginia Brick Co	8.00
Amherst	VA	M V Templeton & Sons Inc	6.00
Amherst	VA	Central Va Training Center	1.00
Amherst	VA	Glad Manufacturing Company	1.00
Amherst	VA	Old Dominion Job Corps Center	0.26
Appomattox	VA	Transco Station 170	7.00
Appomattox	VA	Thomasville Furniture Ind Inc-Va Operations	3.00
Bedford	VA	Georgia Pacific Corp Big Island Plt	388.00
Bedford	VA	Taylor-Ramsey Corporation	52.00
Bedford	VA	Rubatex Corp Plants 1 & 2	26.00
Bedford city	VA	Waltex Corporation	20.00
Bedford city	VA	Golden West Foods Inc	14.00
Bedford city	VA	Wheelabrator Abrasives Incorporated	1.00
Bedford city	VA	Sam Moore Furniture Inds Inc	1.00
Botetourt	VA	Roanoke Cement Company	207.00
Botetourt	VA	General Shale Products Llc	66.00
Botetourt	VA	Va Forge Co Inc	56.00
Botetourt	VA	Columbia Gas Transmission Corporation Gala Compres	1.00
Botetourt	VA	Groendyk Mfg Co Inc	0.13
Buena Vista city	VA	Mundet-Hermetite Inc	0.01
Campbell	VA	Intermet Foundry Archer Creek	365.00
Campbell	VA	Georgia Pacific Corp Brookneal Plt	64.00
Campbell	VA	Dan River Inc Brookneal Plant	24.00
Campbell	VA	Burruss Company	8.00
Campbell	VA	Bgf Industries Inc	5.00
Campbell	VA	Mays Farmers Service	3.00
Campbell	VA	Altavista Power Station	3.00
Campbell	VA	Lane Co Inc Altavista Plt	1.00
Campbell	VA	Abbott Laboratories Ross Prdts Div	1.00
Campbell	VA	Marvin V Templeton & Sons	0.43
Campbell	VA	Bwx Technologies Inc	0.25
Campbell	VA	A.O. Smith Electrical Products Company	0.05
Campbell	VA	Charter Of Lynchburg Inc	0.00
Covington city	VA	Westvaco Pulp Mill	489.00
Covington city	VA	Westvaco Virginia Inc Chemical Division	96.00
Covington city	VA	Aet Packaging Films	1.00
Danville city	VA	Masonite Corp	49.00
Danville city	VA	Dan River Incorporated Schoolfield	15.00
Danville city	VA	Corning Inc	10.00
Danville city	VA	Hickson Danchem Corporation	5.00
Danville city	VA	Dimon International Inc	5.00

Danville city	VA	Intertape Polymer Corp	0.10
Franklin	VA	Cooper Wood Products Incorporated	25.00
Franklin	VA	Erath Veneer Corporation Of Virginia	22.00
Franklin	VA	Lane Co Inc Rocky Mount Plt	11.00
Franklin	VA	Mw Manufacturers Inc	8.00
Franklin	VA	Ronile Inc	0.35
Franklin	VA	Scott Manufacturing Inc	0.07
Franklin	VA	Technifoam Div Of P I Inc	0.02
Giles	VA	American Electric Power Glen Lyn	97.00
Giles	VA	Chemical Lime Company - Kimballton Plant	82.00
Giles	VA	Celanese Acetate Llc	49.00
Halifax	VA	J M Huber Corp	54.00
Halifax	VA	Virginia Power Clover Power Station	34.00
Halifax	VA	Plantation Pipeline Company	29.00
Halifax	VA	Burlington Industries Inc Halifax	5.00
Halifax	VA	D-Scan Furniture	3.00
Halifax	VA	Jps Converter And Industrial Corporation	2.00
Halifax	VA	Bhk Of America	1.00
Halifax	VA	Tomkins Industries Lasco Bathware	1.00
Halifax	VA	Felton Brothers Transit Mix Incorporated	1.00
Halifax	VA	Abb Power Generation Inc	0.49
Halifax	VA	Apac-Virginia (South Boston)	0.46
Lynchburg city	VA	Griffin Pipe Products Company	117.00
Lynchburg city	VA	The Burruss Company Lynchburg	20.00
Lynchburg city	VA	Rock Tenn Co Mill	5.00
Lynchburg city	VA	Frito Lay Incorporated	4.00
Lynchburg city	VA	R R Donnelley Printing Co	1.00
Lynchburg city	VA	Delta Star Incorporated	0.15
Montgomery	VA	Alliant Ammunition & Powder Company Llc	36.00
Montgomery	VA	Corning Inc Blacksburg Plt	24.00
Montgomery	VA	Vpi & State University	23.00
Montgomery	VA	Wolverine Gasket Division - Eagle-Picher Ind.	0.07
Montgomery	VA	Wolverine Gasket Div Eagle-Picher	0.03
Pittsylvania	VA	Goodyear Tire And Rubber Company Danville	70.00
Pittsylvania	VA	Owens-Brockway Glass Co	56.00
Pittsylvania	VA	Burlington Industries Incorporated Hurt Fin. Plant	49.00
Pittsylvania	VA	Transco Gas Pipe Line Corp Station 165	33.00
Pittsylvania	VA	Multitrade Of Pittsylvania Co Lp	18.00
Pittsylvania	VA	Columbia Forest Products	6.00
Pittsylvania	VA	Southern Processors	1.00
Pittsylvania	VA	Southside Manufacturing Inc	1.00
Pittsylvania	VA	Columbia Flooring	1.00
Pittsylvania	VA	Register Publishing Co	0.02
Pulaski	VA	Pulaski Furniture Corp Pulaski	53.00
Pulaski	VA	Ethan Allen	4.00
Pulaski	VA	Gallimore Paving Corp	4.00
Pulaski	VA	Volvo Trucks/North America Inc	1.00
Pulaski	VA	Magnox Pulaski Inc	1.00
Pulaski	VA	Adams Construction Co Dublin	1.00
Pulaski	VA	Pulaski Community Hospital	0.25

Pulaski	VA	Jefferson Mills Incorporated	0.03
Radford city	VA	Intermet Corporation Radford	225.00
Roanoke	VA	Roanoke Electric Steel Corporation Roanoke Plant	54.00
Roanoke	VA	Koppers Incorporated Salem Plant	6.00
Roanoke	VA	Salem Frame Co	3.00
Roanoke	VA	Catawba Hospital	1.00
Roanoke	VA	Carillion Roanoke Community Hospital	1.00
Roanoke	VA	Ingersoll Rand Co	0.47
Roanoke	VA	Rowe Furniture Corporation	0.04
Roanoke	VA	Halmode Apparel	0.01
Roanoke city	VA	Norfolk Southern Railway Company East End Shops	24.00
Roanoke city	VA	Hooker Furniture Corp	7.00
Roanoke city	VA	Fred Whitaker Co	0.22
Roanoke city	VA	Associated Asphalt Inc	0.09
Roanoke city	VA	Akzo Nobel Coatings Inc	0.02
Rockbridge	VA	Burlington Industries Inc	44.00
Rockbridge	VA	Taylor-Ramsey Natural Bridge Station	19.00
Rockbridge	VA	Stillwater Incorporated Goshen Plant	4.00
Rockbridge	VA	Burke-Parsons-Bowlby	2.00
Salem city	VA	Yokohama Tire Corp	16.00
Salem city	VA	John W Hancock Jr Incorporated	11.00
Salem city	VA	Old Virginia Brick Co	9.00

Table 3: NO_x emissions (TPY) from point sources in the vicinity of Roanoke

COUNTY	ST	FACILITY NAME	EMISSIONS
Person	NC	Cp&L - Mayo Facility	13656.00
Person	NC	Louisiana-Pacific Corp - Roxboro	158.00
Alleghany	VA	Virginia Power Low Moor	55.00
Alleghany	VA	Acadia Polymers	3.00
Amherst	VA	Old Virginia Brick Co	12.00
Amherst	VA	Central Va Training Center	11.00
Amherst	VA	Old Dominion Job Corps Center	1.00
Amherst	VA	M V Templeton & Sons Inc	1.00
Amherst	VA	Greif Brothers Corporation Of Virginia Riverville	649.00
Appomattox	VA	Thomasville Furniture Ind Inc-Va Operations	17.00
Appomattox	VA	Transco Station 170	6138.00
Bedford	VA	Rubutex Corp Plants 1 & 2	34.00
Bedford	VA	Taylor-Ramsey Corporation	2.00
Bedford	VA	Georgia Pacific Corp Big Island Plt	912.00
Bedford city	VA	Wheelabrator Abrasives Incorporated	12.00
Bedford city	VA	Waltex Corporation	10.00
Bedford city	VA	Golden West Foods Inc	3.00
Bedford city	VA	Sam Moore Furniture Inds Inc	1.00
Botetourt	VA	General Shale Products Llc	33.00
Botetourt	VA	Groendyk Mfg Co Inc	4.00
Botetourt	VA	Roanoke Cement Company	1803.00
Botetourt	VA	Columbia Gas Transmission Corporation Gala Compres	83.00
Buena Vista city	VA	Mundet-Hermetite Inc	1.00
Campbell	VA	Intermet Foundry Archer Creek	57.00
Campbell	VA	Bwx Technologies Inc	38.00
Campbell	VA	Burruss Company	16.00
Campbell	VA	Bgf Industries Inc	14.00
Campbell	VA	Abbott Laboratories Ross Prdts Div	12.00
Campbell	VA	Marvin V Templeton & Sons	9.00
Campbell	VA	Charter Of Lynchburg Inc	1.00
Campbell	VA	A.O. Smith Electrical Products Company	0.45
Campbell	VA	Georgia Pacific Corp Brookneal Plt	164.00
Campbell	VA	Altavista Power Station	103.00
Campbell	VA	Dan River Inc Brookneal Plant	86.00
Covington city	VA	Westvaco Virginia Inc Chemical Division	57.00
Covington city	VA	Aet Packaging Films	16.00
Covington city	VA	Westvaco Pulp Mill	5719.00
Danville city	VA	Masonite Corp	54.00
Danville city	VA	Corning Inc	25.00
Danville city	VA	Hickson Danchem Corporation	10.00
Danville city	VA	Intertape Polymer Corp	5.00
Danville city	VA	Dan River Incorporated Schoolfield	666.00
Danville city	VA	Dimon International Inc	81.00
Franklin	VA	Ronile Inc	11.00
Franklin	VA	Lane Co Inc Rocky Mount Plt	10.00
Franklin	VA	Mw Manufacturers Inc	5.00
Franklin	VA	Cooper Wood Products Incorporated	3.00
Franklin	VA	Erath Veneer Corporation Of Virginia	3.00

Franklin	VA	Ferguson Land And Lumber Company	2.00
Franklin	VA	Technifoam Div Of P I Inc	0.32
Franklin	VA	Scott Manufacturing Inc	0.04
Giles	VA	American Electric Power Glen Lyn	7021.00
Giles	VA	Celanese Acetate Llc	3662.00
Giles	VA	Chemical Lime Company - Kimballton Plant	826.00
Halifax	VA	Plantation Pipeline Company	14.00
Halifax	VA	Burlington Industries Inc Halifax	14.00
Halifax	VA	Apac-Virginia (South Boston)	14.00
Halifax	VA	Jps Converter And Industrial Corporation	8.00
Halifax	VA	Felton Brothers Transit Mix Incorporated	5.00
Halifax	VA	Abb Power Generation Inc	4.00
Halifax	VA	D-Scan Furniture	1.00
Halifax	VA	Tomkins Industries Lasco Bathware	1.00
Halifax	VA	Virginia Power Clover Power Station	10030.00
Halifax	VA	J M Huber Corp	99.00
Lynchburg city	VA	Griffin Pipe Products Company	39.00
Lynchburg city	VA	R R Donnelley Printing Co	14.00
Lynchburg city	VA	Frito Lay Incorporated	10.00
Lynchburg city	VA	The Burruss Company Lynchburg	9.00
Lynchburg city	VA	Delta Star Incorporated	1.00
Lynchburg city	VA	Rock Tenn Co Mill	533.00
Montgomery	VA	Corning Inc Blacksburg Plt	32.00
Montgomery	VA	Wolverine Gasket Div Eagle-Picher	18.00
Montgomery	VA	Wolverine Gasket Division - Eagle-Picher Ind.	2.00
Montgomery	VA	Alliant Ammunition & Powder Company Llc	1168.00
Montgomery	VA	Vpi & State University	151.00
Pittsylvania	VA	Southern Processors	7.00
Pittsylvania	VA	Columbia Forest Products	1.00
Pittsylvania	VA	Register Publishing Co	1.00
Pittsylvania	VA	Southside Manufacturing Inc	0.42
Pittsylvania	VA	Columbia Flooring	0.18
Pittsylvania	VA	Transco Gas Pipe Line Corp Station 165	3192.00
Pittsylvania	VA	Owens-Brockway Glass Co	493.00
Pittsylvania	VA	Burlington Industries Incorporated Hurt Fin. Plant	259.00
Pittsylvania	VA	Multitrade Of Pittsylvania Co Lp	85.00
Pittsylvania	VA	Goodyear Tire And Rubber Company Danville	72.00
Pulaski	VA	Volvo Trucks/North America Inc	22.00
Pulaski	VA	Pulaski Furniture Corp Pulaski	13.00
Pulaski	VA	Magnox Pulaski Inc	12.00
Pulaski	VA	Pulaski Community Hospital	12.00
Pulaski	VA	Adams Construction Co Dublin	5.00
Pulaski	VA	Ethan Allen	4.00
Pulaski	VA	Jefferson Mills Incorporated	1.00
Radford city	VA	Intermet Corporation Radford	48.00
Roanoke	VA	Ingersoll Rand Co	16.00
Roanoke	VA	Koppers Incorporated Salem Plant	15.00
Roanoke	VA	Carillion Roanoke Community Hospital	11.00
Roanoke	VA	Catawba Hospital	6.00
Roanoke	VA	Salem Frame Co	2.00

Roanoke	VA	Halmode Apparel	1.00
Roanoke	VA	Rowe Furniture Corporation	0.30
Roanoke	VA	Roanoke Electric Steel Corporation Roanoke Plant	185.00
Roanoke city	VA	Fred Whitaker Co	10.00
Roanoke city	VA	Hooker Furniture Corp	3.00
Roanoke city	VA	Associated Asphalt Inc	3.00
Roanoke city	VA	Akzo Nobel Coatings Inc	0.32
Roanoke city	VA	Norfolk Southern Railway Company East End Shops	155.00
Rockbridge	VA	Stillwater Incorporated Goshen Plant	11.00
Rockbridge	VA	Taylor-Ramsey Natural Bridge Station	3.00
Rockbridge	VA	Burke-Parsons-Bowlby	1.00
Rockbridge	VA	Burlington Industries Inc	117.00
Salem city	VA	Old Virginia Brick Co	16.00
Salem city	VA	Yokohama Tire Corp	9.00
Salem city	VA	John W Hancock Jr Incorporated	515.00

Table 4: SO₂ emissions (TPY) from point sources in the vicinity of Bristol.

COUNTY	ST	FACILITY NAME	EMISSIONS
Floyd	KY	Mountain Enterprises, Inc.	1.00
Floyd	KY	Medisin, Inc	1.00
Floyd	KY	Columbia Gas Trans Corp	0.29
Floyd	KY	Mountian Metal Co	0.11
Floyd	KY	Kentucky W.Va Gas Company	0.04
Floyd	KY	Appalachian Reg Hospital	0.02
Harlan	KY	Harlan Applchn Reg Hosptl	28.00
Harlan	KY	Readymix Concrete Somerse	8.00
Harlan	KY	Mountain Enterprises Inc	10.00
Harlan	KY	Harlan Nehi Bottling Co	0.29
Harlan	KY	Baxter Metal Company	0.03
Knott	KY	Ky West Virginia Gas Co	0.03
Letcher	KY	Mountain Enterprises Inc	1.00
Perry	KY	Mountain Enterprises Inc	21.00
Perry	KY	Trus Joist Macmillan	3.00
Perry	KY	Magic Mart Inc	0.13
Perry	KY	Ky W Virginia Gas Co Llc	0.03
Pike	KY	Mountain Enterprise Inc	1.00
Pike	KY	Columbia Gas Transmission Corp.	0.14
Pike	KY	Ky W Virginia Gas Co Llc	0.03
Ashe	NC	The Gates Rubber Company	24.00
Ashe	NC	Leviton Manufacturing	7.00
Ashe	NC	James R Vannoy & Sons Construction	6.00
Ashe	NC	United Chemi - Con Inc	4.00
Ashe	NC	Thomasville Furniture West Jeff Plant	3.00
Ashe	NC	Catawissa Lumber & Specialty Co Inc	0.45
Ashe	NC	Mountain Stone	0.26
Ashe	NC	Cardinal Stone Company	0.06
Ashe	NC	Macro Hdw Inc. M&M Wood Products	0.01
Watauga	NC	Appalachian State University	40.00
Watauga	NC	Watauga Medical Center	8.00
Watauga	NC	Watauga County High School	3.00
Watauga	NC	Watauga Wood Products Inc	1.00
Watauga	NC	Maymead Materials Inc	1.00
Watauga	NC	International Resistive Company	0.23
Watauga	NC	Green Valley Elementary School	0.22
Watauga	NC	Boone Wwtp	0.05
Carter	TN	North American Rayon	2361.00
Carter	TN	Summers-Taylor Inc Watauga	11.00
Greene	TN	Plus Mark Inc	83.00
Hamblen	TN	Basf Fibers Hwy 160 Lowland	5432.00
Hamblen	TN	Lea Industries Plant #4	11.00
Hamblen	TN	Shelby Williams Bx 1028 Morristwn 37814	4.00
Hamblen	TN	Custom Woodworking Plant #2	3.00
Hamblen	TN	Triangle Pacific #2 300 Daisy St Morris	3.00
Hamblen	TN	Shelby Williams	1.00
Hawkins	TN	Tva-John Sevier	61893.00

Hawkins	TN	Holston Army Amm Plt	1200.00
Hawkins	TN	Holliston Mills	491.00
Hawkins	TN	Afg Industries	377.00
Hawkins	TN	Ipc Dennison Co	258.00
Hawkins	TN	Arcata Graphics/Hwkn	19.00
Sullivan	TN	Eastman, Tenn. Co	45141.00
Sullivan	TN	Mead Corp	3466.00
Sullivan	TN	Holston Army Amm Plt	3374.00
Sullivan	TN	General Shale	626.00
Sullivan	TN	Holston Valley Hosp	582.00
Sullivan	TN	Tenn Eastman Co Po Box 511 Kingspor	491.00
Sullivan	TN	Tenn Eastman Co Po Box 511 Kingspor	147.00
Sullivan	TN	Arcata Graphics Inc	89.00
Sullivan	TN	Tennessee Eastman	65.00
Sullivan	TN	Cortrim Mfg Co	11.00
Sullivan	TN	Tenn Eastman Co Po Box 511 Kingspor	4.00
Sullivan	TN	Tn Eastman Inc	1.00
Washington	TN	East Tenn. State U	533.00
Washington	TN	General Shale	201.00
Washington	TN	Gordons Inc.	28.00
Washington	TN	Am Hospital Supply	9.00
Washington	TN	Empire Furniture	7.00
Washington	TN	Tarkett Hardwood	1.00
Bristol city	VA	Bristol City	0.13
Bristol city	VA	Strongwell Corporation/Bristol Division	0.00
Buchanan	VA	Jewel Coke Company Llp	5085.00
Buchanan	VA	Island Creek Coal Company/Virginia Pocahontas Mine	32.00
Buchanan	VA	Island Creek Coal Company/Virginia Pocahontas Mine	25.00
Buchanan	VA	Vdoc	23.00
Dickenson	VA	Clinchfield Coal Company/Mcclure # 1 Mine & Prepar	34.00
Dickenson	VA	East Tennessee Natural Gas Company/Station 3401	0.17
Dickenson	VA	Equitable Production Company/Ramsey Ridge	0.02
Lee	VA	Powell Valley Stone	2.00
Russell	VA	American Electric Power/Clinch River Plant	24435.00
Russell	VA	Clinchfield Coal Company/Moss #3 Preparation Plant	38.00
Russell	VA	Maymeade Lime Company	17.00
Russell	VA	W-L Construction & Paving Incorporated/Castlewood	4.00
Smyth	VA	General Shale Products Llc	153.00
Smyth	VA	Pcs Phosphate Company Incorporated/Saltville	16.00
Smyth	VA	Visador Company/Marion Main Plant	1.00
Smyth	VA	Lea Industries Design Horizon Plant # 17	0.45
Smyth	VA	George S. Rouse	0.40
Smyth	VA	Merillat Corporation	0.34
Smyth	VA	Woodgrain Millwork Incorporated	0.19
Smyth	VA	American Of Martinsville/Plant # 12	0.19
Smyth	VA	Virginia House Furniture/Plant 2	0.15
Smyth	VA	Virginia House Furniture	0.12
Smyth	VA	Marion Composites/Advanced Technical Prod/Plant 1	0.03
Smyth	VA	Utility Trailer Manufacturing Company	0.02
Smyth	VA	Marley Mouldings Llc	0.00

Tazewell	VA	Woodtech Incorporated	3.00
Washington	VA	Us Gypsum Company Incorporated	101.00
Washington	VA	Barb & Shumaker Incorporated	14.00
Washington	VA	Bristol Compressors	0.06
Washington	VA	Prisma Fibers, Inc.	0.02
Washington	VA	East Tennessee Natural Gas Company	0.01
Wise	VA	W-L Construction & Paving Incorporated/Norton	11.00
Wise	VA	Mountain Energy Incorporated	4.00
Wise	VA	B A Mullican Lumber & Manufacturing Company Incorp	1.00
McDowell	WV	Consolidation Coal Co - Amonate	28.00

Table 5: PM_{2.5} emissions (TPY) from point sources in the vicinity of Bristol.

COUNTY	ST	FACILITY NAME	EMISSIONS
Floyd	KY	Lodestar Energy Inc	16.00
Floyd	KY	Columbia Gas Trans Corp	15.00
Floyd	KY	Martin Coal Processing Cp	5.00
Floyd	KY	Mountain Enterprises, Inc.	4.00
Floyd	KY	Kentucky W.Va Gas Company	4.00
Floyd	KY	Medisin, Inc	1.00
Floyd	KY	Kentucky May Coal Co Inc	1.00
Floyd	KY	South Lake Processing	1.00
Floyd	KY	Joseph Mining Co	0.26
Floyd	KY	Appalachian Reg Hospital	0.20
Floyd	KY	Kentucky Hydrocarbon Co	0.07
Floyd	KY	Wells Ready Mix Concrete	0.07
Floyd	KY	Mountian Metal Co	0.05
Floyd	KY	Dowell Schlumberger Inc	0.00
Harlan	KY	Dixie Fuel Company	29.00
Harlan	KY	Shamrock Coal Company Inc	15.00
Harlan	KY	Manalapan Mining Co	13.00
Harlan	KY	Nally & Haydon Inc	11.00
Harlan	KY	Harlan Cumberland Coal Co	7.00
Harlan	KY	Forest Products Inc	3.00
Harlan	KY	Gaines Lumber Co	2.00
Harlan	KY	Shamrock Fuel Inc	2.00
Harlan	KY	Nally & Hamilton Ent Inc	1.00
Harlan	KY	Manalapan Mining Co Inc	1.00
Harlan	KY	Mountain Enterprises Inc	1.00
Harlan	KY	Harlan Applchn Reg Hosptl	1.00
Harlan	KY	Readymix Concrete Somerse	0.47
Harlan	KY	Harlan Cumberland Coal Co	0.23
Harlan	KY	Mountain Const	0.18
Harlan	KY	Jbd Industrial Fuels Inc	0.05
Harlan	KY	Harlan Nehi Bottling Co	0.05
Harlan	KY	Harlan Ready Mix	0.04
Harlan	KY	Baxter Metal Company	0.02
Knott	KY	Diamond May Coal Company	20.00
Knott	KY	Consol Of Kentucky, Inc.	18.00
Knott	KY	Sunny Knott Coal Inc	11.00
Knott	KY	Kentucky May Coal Co Inc	10.00
Knott	KY	Knott County Mining Co	3.00
Knott	KY	Ky West Virginia Gas Co	3.00
Knott	KY	Right Beaver Ready/Mix	1.00
Knott	KY	Ky May Coal Co	0.00
Letcher	KY	Pine Mountain Lumber Llc	16.00
Letcher	KY	Nally & Haydon Cumberland	16.00
Letcher	KY	Consol Of Kentucky Inc	11.00
Letcher	KY	Golden Oak Mining Co L P	9.00
Letcher	KY	Mountain Materials Llc	5.00
Letcher	KY	Mountain Enterprises Inc	5.00
Letcher	KY	Coastal Coal Co Llc	4.00

Letcher	KY	Pikeville Ready Mix Inc	2.00
Letcher	KY	Ky W Virginia Gas Co Llc	0.21
Letcher	KY	Adams Concrete Products	0.11
Letcher	KY	P C & H Construction Inc	0.06
Perry	KY	Trus Joist Macmillan	59.00
Perry	KY	Whitaker Coal Corp	54.00
Perry	KY	Pine Branch Coal Sales	27.00
Perry	KY	Aceco Inc	20.00
Perry	KY	Blue Diamond Coal Company	19.00
Perry	KY	Blue Diamond Coal Company	15.00
Perry	KY	Buckhorn Processing Co	8.00
Perry	KY	Pine Branch Coal Sales	6.00
Perry	KY	Pine Branch Coal Sales Inc	6.00
Perry	KY	Leeco Inc	4.00
Perry	KY	Ky W Virginia Gas Co Llc	3.00
Perry	KY	Ikerd-Bandy Co Inc	2.00
Perry	KY	Mountain Enterprises Inc	1.00
Perry	KY	Leslie Resources Inc	0.38
Perry	KY	Ky River Reg Animal Shelt	0.36
Perry	KY	Pine Branch Coal Sales	0.17
Perry	KY	Magic Mart Inc	0.17
Pike	KY	Branham & Baker Coal Co	149.00
Pike	KY	Premier Elkhorn Coal Co	68.00
Pike	KY	Mountain Materials Llc	26.00
Pike	KY	Clintwood Elkhorn Mining	22.00
Pike	KY	Sidney Coal Company Inc	18.00
Pike	KY	Holston Mining Inc	16.00
Pike	KY	Lodestar Energy Inc	12.00
Pike	KY	Matrix Coal Company	11.00
Pike	KY	New Ridge Mining Company	9.00
Pike	KY	Sunny Ridge Mining Co	7.00
Pike	KY	Long Fork Coal Company	7.00
Pike	KY	Lodestar Energy Inc	7.00
Pike	KY	Elkhorn Loadout Facility	6.00
Pike	KY	Columbia Gas Transmission Corp.	6.00
Pike	KY	Millard Processing Corp	5.00
Pike	KY	Mc Mining Llc	5.00
Pike	KY	Mccoy Elkhorn Coal Corp	5.00
Pike	KY	Mountain Enterprise Inc	4.00
Pike	KY	Branham & Baker Coal Co	4.00
Pike	KY	Coal-Mac Inc	3.00
Pike	KY	Big Creek Mining Inc	3.00
Pike	KY	Clark Elkhorn Coal Co	3.00
Pike	KY	Sidney Coal Company Inc	2.00
Pike	KY	Chisholm Coal Co	2.00
Pike	KY	Ky W Virginia Gas Co Llc	2.00
Pike	KY	Mccoy Elkhorn Coal Corp	1.00
Pike	KY	Appalachian Land Co	1.00
Pike	KY	Lodestar Energy Inc	0.12
Pike	KY	Mountain Enterprises Inc	0.12

Pike	KY	Pikeville Ready Mix Inc	0.11
Pike	KY	Adams Construction Corp	0.10
Pike	KY	Branham & Baker Coal Co	0.09
Pike	KY	Colley Block Co	0.07
Pike	KY	Pikeville Ready Mix Inc	0.06
Pike	KY	Coal Preparation Inc	0.05
Ashe	NC	Macro Hdw Inc. M&M Wood Products	9.00
Ashe	NC	Thomasville Furniture West Jeff Plant	8.00
Ashe	NC	James R Vannoy & Sons Construction	5.00
Ashe	NC	Cardinal Stone Company	3.00
Ashe	NC	Catawissa Lumber & Specialty Co Inc	2.00
Ashe	NC	Paddy Mountain Lumber Company	1.00
Ashe	NC	The Gates Rubber Company	0.49
Ashe	NC	Mountain Stone	0.40
Ashe	NC	United Chemi - Con Inc	0.30
Ashe	NC	Leviton Manufacturing	0.07
Ashe	NC	American Emergency Vehicle	0.03
Ashe	NC	Watauga Ready Mix - West Jeffrson Plant	0.03
Watauga	NC	Vulcan Materials - Boone Quarry	13.00
Watauga	NC	Watauga Wood Products Inc	5.00
Watauga	NC	Watauga Ready Mix - Boone Plant	3.00
Watauga	NC	Appalachian State University	1.00
Watauga	NC	Watauga Ready Mix - Blowing Rock Plant	1.00
Watauga	NC	Watauga County High School	0.46
Watauga	NC	Maymead Materials Inc	0.37
Watauga	NC	Rh Loven Company Inc	0.25
Watauga	NC	Perrys Construction And Concrete Pumping	0.22
Watauga	NC	Radford Quarries Of Boone Incorporated	0.21
Watauga	NC	Boone Custom Forest Products	0.14
Watauga	NC	Green Valley Elementary School	0.05
Watauga	NC	Watauga Medical Center	0.03
Watauga	NC	New River Building Supply & Lumber Co	0.02
Watauga	NC	International Resistive Company	0.01
Carter	TN	North American Rayon	163.00
Carter	TN	Summers-Taylor Inc Watauga	69.00
Greene	TN	Doehler-Jarvis/Earley Ind. Rufe Tay	206.00
Greene	TN	Franklin Furniture	112.00
Greene	TN	Plus Mark Inc	6.00
Greene	TN	Philips Consumer Ele	5.00
Greene	TN	Quaker House Inc	1.00
Hamblen	TN	Lea Industries Plant #4	183.00
Hamblen	TN	Basf Fibers Hwy 160 Lowland	169.00
Hamblen	TN	Universal Bedroom Furn Plt #2	26.00
Hamblen	TN	Shelby Williams Bx 1028 Morristwn 37814	23.00
Hamblen	TN	Custom Woodworking Plant #2	22.00
Hamblen	TN	Young'S Furniture Mfg. Co., Inc.	13.00
Hamblen	TN	Triangle Pacific #2 300 Daisy St Morris	6.00
Hamblen	TN	W. R. Grace & Company	5.00
Hamblen	TN	Triangle Pacific #1 1007 Trade St Morri	4.00
Hawkins	TN	Afg Industries	123.00

Hawkins	TN	Holliston Mills	105.00
Hawkins	TN	Tva-John Sevier	73.00
Hawkins	TN	Holston Army Amm Plt	36.00
Hawkins	TN	Ipc Dennison Co	14.00
Hawkins	TN	Arcata Graphics/Hwkn	2.00
Hawkins	TN	Alladin Plastics Inc Phipps Bnd Rd	1.00
Sullivan	TN	Mead Corp	498.00
Sullivan	TN	Tennessee Eastman	329.00
Sullivan	TN	Eastman, Tenn. Co	323.00
Sullivan	TN	Holston Army Amm Plt	199.00
Sullivan	TN	Tenn Eastman Co Po Box 511 Kingspor	139.00
Sullivan	TN	Tenn Eastman Co Po Box 511 Kingspor	98.00
Sullivan	TN	Tn Eastman Inc	81.00
Sullivan	TN	General Shale	70.00
Sullivan	TN	Tenn Eastman Co Po Box 511 Kingspor	61.00
Sullivan	TN	American Limestone	25.00
Sullivan	TN	Holston Valley Hosp	14.00
Sullivan	TN	Tenn Eastman Co Po Box 511 Kingspor	13.00
Sullivan	TN	Cortrim Mfg Co	13.00
Sullivan	TN	Arcata Graphics Inc	8.00
Sullivan	TN	East Tn Natural Gas	7.00
Sullivan	TN	Tenn Eastman Co Po Box 511 Kingspor	1.00
Washington	TN	General Shale	60.00
Washington	TN	Tarkett Hardwood	56.00
Washington	TN	East Tenn. State U	34.00
Washington	TN	Empire Furniture	25.00
Washington	TN	Gordons Inc.	24.00
Washington	TN	Am Hospital Supply	14.00
Bristol city	VA	Bristol City	0.05
Bristol city	VA	Strongwell Corporation/Bristol Division	0.02
Buchanan	VA	Jewel Coke Company Llp	562.00
Buchanan	VA	Consolidation Coal Company/Buchanan Mine # 1	72.00
Buchanan	VA	Island Creek Coal Company/Virginia Pocahontas Mine	18.00
Buchanan	VA	Island Creek Coal Company/Virginia Pocahontas Mine	15.00
Buchanan	VA	Jewell Smokless Coal Corporation	3.00
Buchanan	VA	Vdoc	1.00
Buchanan	VA	Rapoca Energy Company/Blackwatch Division	1.00
Dickenson	VA	Clinchfield Coal Company/Mcclure # 1 Mine & Prepar	17.00
Dickenson	VA	East Tennessee Natural Gas Company/Station 3401	3.00
Dickenson	VA	Equitable Production Company/Ramsey Ridge	0.40
Lee	VA	Powell Mountain Coal Preparation Plant	0.28
Lee	VA	Powell Valley Stone	0.10
Russell	VA	American Electric Power/Clinch River Plant	170.00
Russell	VA	W-L Construction & Paving Incorporated/Castlewood	24.00
Russell	VA	Reynolds Wheels International Virginia Incorporate	24.00
Russell	VA	Clinchfield Coal Company/Moss #3 Preparation Plant	13.00
Russell	VA	E Dillon & Company	6.00
Russell	VA	Maymeade Lime Company	0.35
Smyth	VA	Visador Company/Marion Main Plant	29.00
Smyth	VA	Pcs Phosphate Company Incorporated/Saltville	13.00

Smyth	VA	Lea Industries Design Horizon Plant # 17	7.00
Smyth	VA	Virginia House Furniture/Plant 2	6.00
Smyth	VA	Virginia House Furniture	5.00
Smyth	VA	Woodgrain Millwork Incorporated	2.00
Smyth	VA	American Of Martinsville/Plant # 12	2.00
Smyth	VA	George S. Rouse	0.39
Smyth	VA	Marley Mouldings Llc	0.06
Smyth	VA	Marion Composites/Advanced Technical Prod/Plant 1	0.03
Tazewell	VA	Pounding Mill Quarry Corporation/Pounding Mill Pla	34.00
Tazewell	VA	A T Massey/Knox Creek Coal Corporation	1.00
Washington	VA	Us Gypsum Company Incorporated	14.00
Washington	VA	Prisma Fibers, Inc.	4.00
Washington	VA	Bristol Compressors	2.00
Washington	VA	Barb & Shumaker Incorporated	1.00
Washington	VA	East Tennessee Natural Gas Company	0.01
Wise	VA	B A Mullican Lumber & Manufacturing Company Incorp	18.00
Wise	VA	Mountain Energy Incorporated	4.00
Wise	VA	Coastal Coal Company Llc	4.00
Wise	VA	Paramont Coal Corporation	1.00
Wise	VA	W-L Construction & Paving Incorporated/Norton	0.36
Wise	VA	Pigeon Creek Processing Llc	0.33
McDowell	WV	Consolidation Coal Co - Amonate	4.00

Table 6: NO_x emissions (TPY) from point sources in the vicinity of Bristol.

COUNTY	ST	FACILITY NAME	EMISSIONS
Floyd	KY	Columbia Natural Resource	61.00
Floyd	KY	Kentucky Hydrocarbon Co	21.00
Floyd	KY	Appalachian Reg Hospital	5.00
Floyd	KY	Mountain Enterprises, Inc.	4.00
Floyd	KY	Medisin, Inc	1.00
Floyd	KY	Kentucky Hydrocarbon Co	0.10
Floyd	KY	Mountian Metal Co	0.06
Floyd	KY	Columbia Gas Trans Corp	617.00
Floyd	KY	Kentucky W.Va Gas Company	452.00
Harlan	KY	Harlan Applchn Reg Hosptl	8.00
Harlan	KY	Mountain Enterprises Inc	1.00
Harlan	KY	Readymix Concrete Somerse	0.26
Harlan	KY	Harlan Nehi Bottling Co	0.11
Harlan	KY	Baxter Metal Company	0.02
Knott	KY	Ky West Virginia Gas Co	208.00
Letcher	KY	Ky W Virginia Gas Co Llc	12.00
Letcher	KY	Mountain Enterprises Inc	4.00
Perry	KY	Mountain Enterprises Inc	1.00
Perry	KY	Magic Mart Inc	0.16
Perry	KY	Ky River Reg Animal Shelt	0.15
Perry	KY	Ky W Virginia Gas Co Llc	363.00
Perry	KY	Trus Joist Macmillan	94.00
Pike	KY	Columbia Natural Resource	53.00
Pike	KY	Columbia Natural Resource	26.00
Pike	KY	Columbia Natural Resource	18.00
Pike	KY	Mountain Enterprise Inc	9.00
Pike	KY	Mountain Enterprises Inc	0.12
Pike	KY	Columbia Gas Transmission Corp.	525.00
Pike	KY	Ky W Virginia Gas Co Llc	144.00
Ashe	NC	Thomasville Furniture West Jeff Plant	22.00
Ashe	NC	James R Vannoy & Sons Construction	9.00
Ashe	NC	Catawissa Lumber & Specialty Co Inc	9.00
Ashe	NC	United Chemi - Con Inc	5.00
Ashe	NC	Mountain Stone	4.00
Ashe	NC	The Gates Rubber Company	3.00
Ashe	NC	Leviton Manufacturing	2.00
Ashe	NC	Macro Hdw Inc. M&M Wood Products	1.00
Ashe	NC	American Emergency Vehicle	0.42
Ashe	NC	Cardinal Stone Company	0.39
Watauga	NC	Appalachian State University	28.00
Watauga	NC	Watauga Wood Products Inc	11.00
Watauga	NC	Watauga Medical Center	10.00
Watauga	NC	Maymead Materials Inc	6.00
Watauga	NC	Maymead Materials Inc	3.00
Watauga	NC	Hearthstone Enterprises Inc - Boone Plt	1.00
Watauga	NC	Watauga County High School	1.00
Watauga	NC	Green Valley Elementary School	0.11
Watauga	NC	Boone Wwtp	0.07

Watauga	NC	International Resistive Company	0.06
Carter	TN	North American Rayon	464.00
Carter	TN	Summers-Taylor Inc Watauga	65.00
Greene	TN	Plus Mark Inc	23.00
Greene	TN	Tuscarora Plastics Inc 1749 Ind Rd	7.00
Greene	TN	Doehler-Jarvis/Earley Ind. Rufe Tay	2.00
Greene	TN	Franklin Furniture	1.00
Greene	TN	Quaker House Inc	1.00
Hamblen	TN	Lea Industries Plant #4	33.00
Hamblen	TN	Universal Bedroom Furn Plt #2	19.00
Hamblen	TN	Shelby Williams Bx 1028 Morristwn 37814	17.00
Hamblen	TN	Triangle Pacific #2 300 Daisy St Morris	13.00
Hamblen	TN	Berkline Corp Plant #1 Liberty Hill Rd M	6.00
Hamblen	TN	Young'S Furniture Mfg. Co., Inc.	3.00
Hamblen	TN	Shelby Williams	3.00
Hamblen	TN	W. R. Grace & Company	2.00
Hamblen	TN	Basf Fibers Hwy 160 Lowland	2606.00
Hawkins	TN	Ipc Dennison Co	43.00
Hawkins	TN	Arcata Graphics/Hwkn	9.00
Hawkins	TN	Tva-John Sevier	11784.00
Hawkins	TN	Holston Army Amm Plt	674.00
Hawkins	TN	Holston Army Amm Plt	536.00
Hawkins	TN	Holliston Mills	197.00
Hawkins	TN	Afg Industries	125.00
Sullivan	TN	Cortrim Mfg Co	28.00
Sullivan	TN	Tennessee Eastman	27.00
Sullivan	TN	Arcata Graphics Inc	26.00
Sullivan	TN	Seaman Corporation	2.00
Sullivan	TN	Tenn Eastman Co Po Box 511 Kingspor	2.00
Sullivan	TN	Eastman, Tenn. Co	10523.00
Sullivan	TN	Mead Corp	3206.00
Sullivan	TN	Tenn Eastman Co Po Box 511 Kingspor	2060.00
Sullivan	TN	Holston Army Amm Plt	1405.00
Sullivan	TN	East Tn Natural Gas	709.00
Sullivan	TN	Holston Valley Hosp	288.00
Sullivan	TN	Tn Eastman Inc	228.00
Sullivan	TN	Tenn Eastman Co Po Box 511 Kingspor	176.00
Sullivan	TN	General Shale	121.00
Sullivan	TN	Tenn Eastman Co Po Box 511 Kingspor	89.00
Washington	TN	General Shale	41.00
Washington	TN	Gordons Inc.	27.00
Washington	TN	Am Hospital Supply	16.00
Washington	TN	Empire Furniture	6.00
Washington	TN	Tarkett Hardwood	103.00
Washington	TN	East Tenn. State U	98.00
Bristol city	VA	Bristol City	5.00
Bristol city	VA	Strongwell Corporation/Bristol Division	0.18
Buchanan	VA	Island Creek Coal Company/Virginia Pocahontas Mine	36.00
Buchanan	VA	Island Creek Coal Company/Virginia Pocahontas Mine	35.00
Buchanan	VA	Consolidation Coal Company/Buchanan Mine # 1	26.00

Buchanan	VA	Columbia Natural Resources	20.00
Buchanan	VA	Pocahontas Gas Partnership - 2069b	16.00
Buchanan	VA	Consol Incorporated - 91-113	10.00
Buchanan	VA	Vdoc	7.00
Buchanan	VA	Jewel Coke Company Llp	511.00
Dickenson	VA	Equitable Production Company/Ramsey Ridge	31.00
Dickenson	VA	Equitable Production Co-Nancy Community	14.00
Dickenson	VA	Equitable Production Company/Smith Ridge	13.00
Dickenson	VA	Equitable Production Co/Lick Creek-#1 Comp	10.00
Dickenson	VA	Equitable Production Co/Lick Creek-#2 Comp	10.00
Dickenson	VA	Equitable Production Co/Lick Creek-#3 Comp	10.00
Dickenson	VA	Clinchfield Coal Company/Mcclure # 1 Mine & Prepar	81.00
Dickenson	VA	East Tennessee Natural Gas Company/Station 3401	78.00
Galax city	VA	Burruss Company	4.00
Lee	VA	Powell Valley Stone	15.00
Russell	VA	W-L Construction & Paving Incorporated/Castlewood	21.00
Russell	VA	Maymeade Lime Company	7.00
Russell	VA	American Electric Power/Clinch River Plant	20090.00
Russell	VA	Clinchfield Coal Company/Moss #3 Preparation Plant	100.00
Smyth	VA	General Shale Products Llc	41.00
Smyth	VA	George S. Rouse	18.00
Smyth	VA	American Of Martinsville/Plant # 12	4.00
Smyth	VA	Virginia House Furniture/Plant 2	3.00
Smyth	VA	Visador Company/Marion Main Plant	2.00
Smyth	VA	Virginia House Furniture	2.00
Smyth	VA	Merillat Corporation	2.00
Smyth	VA	Lea Industries Design Horizon Plant # 17	2.00
Smyth	VA	Woodgrain Millwork Incorporated	1.00
Smyth	VA	Marion Composites/Advanced Technical Prod/Plant 1	1.00
Smyth	VA	Marley Mouldings Llc	1.00
Smyth	VA	Utility Trailer Manufacturing Company	0.03
Smyth	VA	Pcs Phosphate Company Incorporated/Saltville	73.00
Washington	VA	Us Gypsum Company Incorporated	52.00
Washington	VA	Virginia Gas Storage Company	16.00
Washington	VA	Bristol Compressors	11.00
Washington	VA	Barb & Shumaker Incorporated	4.00
Washington	VA	Prisma Fibers, Inc.	4.00
Washington	VA	East Tennessee Natural Gas Company	73.00
Wise	VA	Equitable Production Company/Appalachia	10.00
Wise	VA	Equitable Production Company/Wise	10.00
Wise	VA	Equitable Production Company E-Region	9.00
Wise	VA	Equitable Production Company/Banner	9.00
Wise	VA	Equitable Prod. Co.-Powell R.-Comp. I3	8.00
Wise	VA	Equitable Prod. Co.-Powell R.-Comp. I1	8.00
Wise	VA	Equitable Prod. Co.-Powell River-Comp. I2	8.00
Wise	VA	Equitable Production Company/Wise	8.00
Wise	VA	Equitable Production Company/Big Stone Gap	7.00
Wise	VA	B A Mullican Lumber & Manufacturing Company Incorp	6.00
Wise	VA	W-L Construction & Paving Incorporated/Norton	4.00
Wise	VA	Mountain Energy Incorporated	66.00

McDowell WV Consolidation Coal Co - Amonate

73.00